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Ophiuroids Collected by the Investigator in the Indian Ocean. I.
The Ophiuroids of the Deep Sea: A Translation of *Ophiures*
Recueillies par l'Investigator dans l'Océan Indien. I. Les Ophiures
de mer Profonde

René Koehler

John M. Lawrence

University of South Florida, lawr@usf.edu

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ECHINODERMA OF THE INDIAN MUSEUM.
OPHIUROIDEA.

AN ACCOUNT
OF THE
DEEP-SEA OPHIUROIDEA

COLLECTED BY THE
ROYAL INDIAN MARINE SURVEY SHIP
INVESTIGATOR

BY
R. KOEHLER,
PROFESSOR OF ZOOLOGY IN THE UNIVERSITY OF LYON.



CALCUTTA:
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1899.

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Translator's note:

In an Editorial note, Dr. Alcock, Superintendent of the Indian Museum, stated that Dr. Kœhler had not seen the proofs of the memoir. Consequently, a list of corrections was added. These corrections concern some phrasing and misspellings. The page numbers given in the list of errors are those in the printed memoir, not those in the translation.

Some minor errors remain, e.g., sometimes Jager instead of Jäger, and inconsistencies, e.g., centrodorsale and centro-dorsal and the names of vessels with and without quotation marks. I have not changed the text as printed.

On the cover pages and the first page of the text, Dr. Kœhler's name is spelled Koehler. I have not changed this. In the rest of the text, his name is spelled Kœhler.

I have retained "Sea of Oman" instead of using the contemporary "Arabian Sea".

I thank Richard L. Turner for his assistance with some taxonomic difficulties.

EDITORIAL NOTE.

The Preface to the Account of the Deep Sea Madreporaria collected by the Royal Indian Marine Survey Ship 'Investigator,' recently published by order of the Trustees of the Indian Museum, explains briefly how the 'Investigator' collections came to be made and to be deposited in the Museum.

I have here only to thank Dr. K  hler, in behalf of the Trustees of the Museum and of the past and present Naturalists of the Ship, for his kindness in naming and describing the Ophiuroidea collected up to the end of the year 1895.

The present Fasciculus relates only to the Deep-sea Ophiuroidea, and Dr. K  hler desires it to be known that he himself has not corrected the proofs either of the text or plates.

A. Alcock, Major, I.M.S.,
Superintendent of the Indian Museum.

OPHIURES

RECUEILLIES PAR

L'INVESTIGATOR

DANS

L'OCÉAN INDIEN.

PAR

R. KOEHLER.

PROFESSEUR DE ZOOLOGIE À L'UNIVERSITÉ DE LYON.

I. LES OPHIURES DE MER PROFONDE.

CALCUTTA.

1899.

ERRATA.

N.B. — The proofs of this work were corrected at Calcutta and have not been reviewed by the author. The reader is thus asked to excuse typographical errors that are encountered, especially in the first pages.

In the Errata that follow, we have corrected only the most important errors without mentioning that that are related only to punctuation and accentuation.

Page 1, ligne 2, au lieu de : recueillis lisez : recueillies.

Page 3, ligne 6, au lieu de : effect lisez : effet.

Page 3, première note, ligne 1, au lieu de: place lisez: placés.

Page 4, ligne 19, au lieu de: papile lisez : papille.

Page 5, ligne 11, au lieu de: peutêtre même les précédentes lisez: peutêtre même les precedentes-elles.

Page, 5, ligne 12, au lieu de : dorsal lisez : dorsale.

Page 5, ligne 27, au lieu de : ressemblance lisez : ressemblance.

Page 8, ligne 1, au lieu de: Studer () lisez: Studer (II).

Page 19, ligne 2, au lieu de : soudés lisez: soudées.

Page 19, ligne 16, au lieu de: rapport lisez: rapporte-

Page 21, ligne 5, au lieu de: côtés lisez: côtes.

Page 21, ligne 19, au lieu de: caractère sse lisez: caractères se.

Page 23, ligne 8, au lieu de: traingulaires lisez: triangulaires.

Page 27, ligne 15, au lieu de: proéminents lisez: proéminentes.

Page 30, ligne 28, au lieu de : parallèles lisez : parallèles.

Page 31, ligne 1, au lieu de : situé lisez: située.

Page 39, ligne 32, au lieu de : développés lisez : développées.

Page 45, ligne 17, au lieu, de: carrés lisez: carrées.

Page 46, ligne 28, au lieu de : elles lisez : elle.

Page 47, ligne 27, au lieu de : spiniform lisez : spiniforme.

Page 50, ligne 7, au lieu de: grosse lisez: grosses.

Page 54, ligne 12, au lieu de: distal lisez : distale.

Page 54, ligne 31, au lieu de : courtes lisez: courts.

Page 55, ligne 8, au lieu de : aplatis lisez : aplatie.

Page 61, ligne 12, au lieu de : couvert lisez : couverte.

Page 66, ligne 12, au lieu de : poximal lisez : proximal.

Page 66, ligne 16, au lieu de: traingulaire lisez: triangulaire.

Page 69, ligne 23, au lieu de : Ja'i lisez : J'ai.

OPHIUROIDS
COLLECTED BY THE "INVESTIGATOR"
IN THE INDIAN OCEAN

By R. KOEHLER

PROFESSOR OF ZOOLOGY AT THE UNIVERSITY OF LYON

OPHIUROIDS OF THE DEEP SEA

I consider as deep-sea forms ophiuroids dredged between 112 and 1,997 fathoms.

The number of deep-sea species collected by the "Investigator" up to 1895 was 56, among which are found 52 Ophiuroidæ and 4 Astrophytonidæ. All these species, with the exception of *Amphiura misera*, were described in a memoir published by the Annales des Sciences Naturelles Zoologie (Eighth series. Vol. IV.). Of these, only 14 were already known and 40 are new. It is convenient to add to the latter a doubtful form of *Ophiocreas*, probably new, that would make their number 41.

The new species or varieties are separated into genera as follows:

<i>Ophiotypa</i> (nov. gen.) ...	1 species.
<i>Ophiopyrgus</i>	1 ---
<i>Ophiomastus</i>	1 ---
<i>Ophioglypha</i>	4 species.
<i>Ophiomusium</i>	2 ---
<i>Ophiopyren</i>	1 species.
<i>Ophiolypus</i>	1 ---
<i>Ophioceramis</i>	1 ---
<i>Ophiozona</i>	1 ---
<i>Ophiopeza</i>	1 ---
<i>Pectinura</i>	1 ---
<i>Ophioconis</i>	1 ---
<i>Ophiactis</i>	2 species.
<i>Amphiura</i>	5 ---
<i>Ophiochiton</i>	2 ---
<i>Ophiacantha</i>	7 ---
<i>Ophiomitra</i>	2 ---
<i>Ophiothrix</i>	1 variety
<i>Ophiomyxa</i>	1 species
<i>Gorgonocephalus</i>	2 species
<i>Ophiocreas</i>	1 species (?)
... 1	

Among the species already known that have been found by the “Investigator”, most had been encountered by the “Challenger” in the Indian Ocean or in the Pacific Ocean (Australia, New Zealand, Sunda Islands, Philippines, Japan).

These are:

Ophioglypha imbecillis Lyman.

— *æqualis* —
 — *palliata* —
 — *radiata* —
 — *sculptilis* —
 — *undulata* —
 — *orbiculata* —

Ophiomusium scalare —

Pectinura heros —

Ophiotrochus panniculus —

The following species have yet to be encountered in the Atlantic Ocean:

Ophiomusium validum Ljungmann.

— *planum* Lyman.

Ophiernus adpersus —

Ophiocamax fasciculata —

Finally, I shall add to this list *Astronyx Loveni* Müller and Troschel, found at the Laccadive Islands at a depth of 406 fathoms. This species, well known on the coasts of Norway, has been encountered by the “Challenger” in the seas of Japan. Its discovery in the Sea of Oman thus is not surprising.

In summary, the species of ophiuroids already known that the “Investigator” has found in the Indian Ocean can be separated in this way:

Species of the Indo-Pacific	10
Species of the Atlantic Ocean.....	4
Species common to the Atlantic and the Pacific	1

The number of observed species is not large enough that their study can lead to a general result of great importance. Nevertheless, some remarks can be made. The ophiuroid forms considered until now restricted to the Atlantic are a great minority and we can say that they are poorly represented in the bottoms explored by the “Investigator.” The affinities of the ophiuroids of these bottoms with those of the Indo-Pacific are to the contrary clearly indicated. It is probable that further research will confirm these affinities. In considering, in fact, the group of ophiuroids collected by the “Investigator,” one is first of all struck by the relatively large number of new species discovered (41 of 55) and then by the complete absence of some types that are very widespread in these great depths, especially in the Atlantic but also in the Pacific (*Ophiomusium Lymani*, for example). But does not the abundance of the new forms indicate that, in part at least, the deep-sea fauna of the Indo-Pacific, that have been explored only by the “Challenger,” is less known than that of the Atlantic Ocean where several underwater campaigns have been executed for twenty years?

The cosmopolitism of the abyssal forms, presently accepted without question and that is affirmed more and more by new examples, does not exclude some groups. It is interesting to find, in the Bay of Bengal and the Sea of Oman, the study of ophiuroids of the deep sea gives results that agree with what has been observed in the distribution of littoral forms in these regions or in adjacent regions. I.e., the forms of the Pacific Ocean dominate there. Certainly I make only a simple remark to which it is not necessary to give the value of a conclusions or a general character that it cannot have given the very limited facts on which it relies.

OPHIOTYPA SIMPLEX K  HLER. (Pl. I, fig. 1, 2 and 3)

1897 *Ophiotypa simplex* **K  hler (3)**¹ p. 281, pl. V., fig. 1, 2 and .3.

Bay of Bengal. Long. 85  43'15"   - Lat. N. 9  34'. Depth: 1997 fathoms. Two specimens.

Disc diameter: 4.5 millimeters; the arms are broken 8 millimeters from the base.

The disk is very elevated and conical on the dorsal surface, flat on the ventral surface. A large part of the dorsal surface is filled by the centrodorsal plate that is remarkably large, very tall and pentagonal in form. It has, on its surface, concentric stripes. Outside are five radials, of large size, although smaller than the preceding. They are hexagonal and also have a striated surface. They are separated from each other by a row or two very small interrarial plates. These six primary plates alone nearly cover the dorsal surface of the disc. In the interrarial spaces we see the distal portion of the ventral interbrachial plate that is advanced a little onto the dorsal surface of the disc.

The ventral surface is covered, in the interbrachial spaces, by a single plate, very large and quadrangular. No genital plate is visible.

The buccal shields are excessively small, triangularly wider than tall. They have a sharp pointed corner and a slightly curved distal border. The adoral plates are very large and trapezoidal. Their proximal side is straight and the adjacent corners are also straight. The internal side, back to back with its congener, is shorter than its external side. The distal side is oblique and the distal corner is sharp. The oral plates are small and triangular. A large conical unpaired papilla surmounts them. Along the free border of the oral plates is a border formed by the fusing of the lateral papillae whose number we cannot determine.

The arms are thin and narrow, but they do not get thinner rapidly. The dorsal arm plates are very small, lozenge-shaped with equal sides. They appear to continue to the end of the arms.

The ventral plates are longer than wide. They have a proximal corner limited by two straight sides. The lateral sides are slightly concave. The distal border is round and narrow. The widest part corresponds to the lateral corners. The size of the ventral plates decreases progressively after the first, which is larger. They separated after the third.

The lateral plates are very large, a little protruding, equally developed on the dorsal and ventral surfaces. Each has a very reduced conical spine near the ventral side.

¹ The numbers in parentheses and in bold refer to numbers in the bibliographic index.

² The longitude refers to the Greenwich meridian.

A very large scale, oval, covers each tentacle pore. The scales of the first pair of pores are not much larger than the following ones.

By the small number of plates on the dorsal surface of the disc and the embryonic arrangement of the plates preserved in the adult and by the absence of radial shields, *Ophiotypa simplex* has very primitive characters.

In fact, the dorsal skeleton of the disc has only the six primary plates, the small interradial plates that separate the latter having here no importance. In order to appreciate the interest in the arrangement observed in an adult animal, it is necessary to refer to the mode of formation of the dorsal skeleton of the disc of ophiuroids in the works of Ludwig, Carpenter Fewes, etc., that we have made known. We know that the first indication of the dorsal skeleton is the centro-dorsal plate and five radial plates that surround it. The five terminal plates that follow the radial plates and that, in the process of development, are moved to the end of the arms, are formed at nearly the same time as the six primary plates, maybe even sometimes precede them. The development of the oral plate, that is at first dorsal, is likewise very early. As for the other plates of the discs, basals, infra-basals, radial shields, etc., they appear later.

Now the radial shields, that are so characteristic of ophiuroids and whose absence has still not been seen in any representative of the order, are completely absent in *Ophiotypa simplex*. As these shields are formed after the six primary plates, we can conclude that the skeleton of the dorsal surface of the disc represents in adult *Ophiotypa*, a very precocious stage of ontogeny of ophiuroids and that the skeleton preserves an arrangement completely embryonic.

The structure of the skeleton of the dorsal surface of the disc in adult *Ophiotypa* recalls in a remarkable way a very young stage seen by Ludwig (5) and Fewkes (1) in the development of *Amphiura squamata*. If we compare the figure I give (Pl. I, fig. 1) of the dorsal surface of *O. simplex*, some figures of Fewkes (1, Pl. II, fig. 13 and 14; Pl. III fig. 18) and of Ludwig (5, Pl. XI, fig. 19), representing very young stages of development of the skeleton of *Amphiura squamata*, we find a very striking and very suggestive resemblance. *Ophiotypa* has thus in the adult state, an arrangement that we observe in ophiuroids only during embryonic development or in a very young stage. It is indisputably the most simple ophiuroid form that has been observed up until now.

The genus *Ophiotypa* is very near the genus *Ophiopygurus* from which it differs especially by the small number of plates that cover the disc and by the absence of buccal shields. We can give it the following diagnosis:

Dorsal surface of the disc nearly entirely covered by the primary plates that are very large; interradial plates very reduced in size and number. A single ventral interradial plate. No genital plate is visible exteriorly. Buccal shields very small; large adoral plates. Arms thin and elongated, tapering slowly and gradually to the end. Tentacle pores each with a large scale. Arm spines rudimentary. Rudimentary arms spines.

Ophiotypa simplex should have a very vast geographical distribution. In fact, by a very curious coincidence, I just found this species among the ophiuroids collected in 1896 by the "Princesse Alice" and which S. A. the Prince of Monaco has kindly given me to examine. A single specimen of *O. simplex* was captured at a depth of 4,360 meters at 20° 18' Long. E and 39° 18' Lat. N. The specimen absolutely conforms to those of the "Investigator" and has the same dimensions. One of the arms is entire and I can assure myself that the arms preserve a width nearly constant until a very short distance from its end.

OPHIOPYRGUS ALCOCKI, K  HLER.
(Pl. I, fig. 4, 5 and 6)

1897.—*Ophiopyrgus Alcocki*, K  hler (3) p. 283, pl. v, fig. 4, 5 and 6.

Bay of Bengal. Long. E. 85 24'. Lat. N. 18  26'. Depth: 1310 fathoms. Only one specimen.

Diameter of the disc: 6 millimeters; length of arms 10 millimeters.

The disc is very tall, strongly convex on the dorsal surface, flat on the ventral surface. The disc has a centro-dorsal plate, large, round, very convex and swollen, but not forming a conical protuberance similar to that of *O. Wyville-Thomsoni*. Around the centro-dorsal plate are arranged five round radial plates, also large and nearly as swollen as it. Afterwards come two radial shields, likewise round, but smaller than the primary plates. In the interrational spaces, we find a row of three successive plates. The dimensions of the first two are the same as those of the radial shields. The third, a little larger, is not visible from the dorsal side. It is located on the lateral surface and passes to the ventral surface of the disc where it joins the corresponding buccal shield. Between this plate and the base of the arm we find a triangular scale whose brachial border has a series of papillae. The first two or three alone are very distinct, while the following four are five are indistinct.

The ventral surface is filled, in the interbrachial spaces and outside the buccal shields, only by the ventral part of the interrational plate reported above. The buccal shields are large, pyriform, with a round proximal angle, lateral sides slightly concave and a distal border very convex and wide. The trapezoidal adoral plates are small. They have a small internal side, a larger external side and a distal border that follows the contour of the corner of the buccal shield. The triangular oral plates are larger than the adorals. Each has two lateral papillae, small and conical. There is, in addition, a terminal papilla whose size does not exceed that of the laterals.

The arms are wide at the base. They taper rapidly to the end that is pointed. The dorsal brachial plates, extremely small, are located in the angle of the lateral plates. They are first lozenge-shaped, then they become triangular, with a convex distal border toward the end of the arms. They are very elongated.

The ventral brachial plates are longer than wide. The first ones have the form of a biscuit with a distal region wider than the proximal region. They have a round proximal corner, sides notched by the tentacle pores and a widened and convex distal side. After the middle of the arms these plates become simply oval. The first one is large and fairly near the second. Then their dimensions decrease rapidly and they are separated more and more from each other.

The lateral brachial plates are very developed. They cover nearly all the surface of the arms. They are a little protuberant. Each has, toward the middle of its distal border, a small rudimentary spine.

The tentacle pores are large. The first four pairs have two scales on each border. The fifth and sixth have no more than one alone on each border. Then the scales generally are absent on the following pores.

All the plates of the disc and the arms, as well as the buccal plates of *O. Alcocki*, are covered with very apparent large round granules.

I am happy to dedicate this very interesting species to my excellent colleague and friend M. Alcock, director of the Museum of Calcutta.

The type of the genus *Ophiopyrgus* is *O. Wyville-Thompsoni*, represented by a single specimen whose diameter of the disc was no greater than 4 millimeters. The specimen had been found by the “Challenger” at Tongatabu at a depth of 18(?)–240 fathoms. The new species dredged by the “Investigator” is easily distinguished from *O. Wyville-Thompsoni* by the much less elevation of the centro-dorsal plate, by the size of the radial scales and the arrangement of the radial combs, by the small dimensions of the two first pairs of tentacle pores that have only two pairs of scales and whose size is little greater than that of the third pair and finally by the smaller number of buccal papillae.

A second species of *Ophiopyrgus* has been shown by Studer (11). It is *O. saccharatur*, but it does not appear certain that this ophiuroid should enter the genus *Ophiopyrgus*. It does not have the elevation so characteristic of the disc and it could perhaps be a new genus intermediate between the genera *Ophiopyrgus* and *Ophioglypha*, as Studer moreover has already remarked.

OPHIOMASTUS TUMIDUS, KÖHLER. (Pl. I, fig. 7, 8 and 9)

1897.—*Ophiomastus tumidus*, **Köhler** (3) p. 285; pl. V. fig. 7, 8 and 9.

Bay of Bengal. Long. E. 85° 24'. Lat. N. 18° 26'. Depth: 1310 fathoms. Five specimens.

Diameter of disc: 4 millimeters; length of arms: 7 to 8 millimeters.

The disc is very thick, but the dorsal surface is relatively little swollen. A large central plate, surrounded by five radial plates of the same dimension, occupies most of the dorsal surface of the disc. These six plates are polygonal. Outside are two radial shields at the base of each arm. These shields are polygonal, a little wider than long and contiguous along their internal border. The interradial spaces have two plates, the proximal one is pentagonal and larger than the radial shields. As for the distal plate, only a very small portion is visible on the dorsal surface. This plate, which occupies especially the lateral surface of the disc, passes onto the ventral side and joins the buccal shield.

On the ventral surface, the buccal shield covers nearly all the interbrachial space. Outside we note on each side two small plates between the buccal shield and the radial shield. There is no distinct genital plate.

The buccal plates, a little longer than wide, are oval, with a very broad proximal corner. The adoral plates are large, in the form of a D, slightly notched outside by the buccal pores. The oral plates are smaller and triangular. They have along their free border two elongated, low buccal papillae. The internal one is shorter. The very long external one is without doubt the fusion of several papillae.

The arms taper very rapidly and become pointed toward the end. The dorsal brachial plates are small and triangular, with a strongly convex proximal and distal side. They are separated from the first.

The ventral plates are longer than wide. They have a proximal corner, two lateral sides notched by the tentacle pores and a convex side. They are very small, except the first that is larger than the others. These plates are separated from the base of the arms.

The lateral plates are very large. They are developed on both the dorsal side and the ventral side. They alone cover nearly all the arm. They are slightly protruding. The first has a single short, conical spine. The second has two or three. The following two or three generally have three of them. Then the others, two only. These spines are short, conical and papilliform.

The tentacle pores are large, especially those of the first pair. They have a single large scale.

It is possible that my specimens are not completely adult because on one of them I find, between two primary radial plates, a very small supernumerary radial plate. This perhaps the indication of a circle of intercalated plates that would have made a later appearance. Whatever it is, the characters of these specimens are clear enough to permit a description and a comparison with the two other known species of *Ophiomastus*, especially since these two species have been described after specimens of the same size or even smaller than those of the "Investigator."

O. tegulitus Lyman was found by the "Challenger" between Australia and New Zealand and to the north-east of New Guinea at 275 and 2,600 fathoms of depth. Lyman has described it according to a specimen whose disc was 4 millimeters in diameter. *O. tumidus* is distinguished easily by the large pentagonal buccal shields in form of plates and not in the form of scales (scale-like), by the form of the ventral brachial plates by the presence of single tentacle scale and finally by the three brachial spines.

O. secundus, captured by the "Blake" in the Caribbean Sea at 339 fathoms of depth, was described by Lyman after a specimen whose diameter was only 2.7 millimeters. This species approaches *O. tumidus* by the presence of a single tentacle scale, but is distinguished from it by its very tall disc in the form of a dome, by the triangular form of the ventral brachial plates, by having only one or two brachial spines and finally by the special arrangement of the buccal shields.

The third species known from the genus *Ophiomastus*, *O. texturatus* Lyman, captured by the "Challenger" at a depth of 310 fathoms is separated notably from *O. tumidus*.

OPHIOGLYPHA INFLATA K  HLER. (Pl. XI; fig. 83, 84 and 85)

1897—*Ophioglypha inflata*, K  hler (3) p. 288, pi. V, fig. 10 and 11.

Off the coast of Colombo. Long. E. 79° 34'. Lat. N. 6° 29'. Depth: 597 fathoms. A single specimen.

Diameter of the disc: 6 millimeters; length of the arms: 15 millimeters; width of the arms at the base: 0.9 millimeters.

The disc has the form of a flat-convex lentil, with the central region very thick and the edges thin and sharp. The plates that cover the dorsal surface are separated from each other by a very deep groove. The central plate is large. Around it are arranged five radial plates that are separated by a circle of five radial plates that are separated by a circle of five smaller interrational plates,

between which we find intercalated still other much smaller plates. Outside each primary radial plate and separated from it by two smaller plates, is a triangular plate sunken like a wedge between the two radial buccal plates. These are large, irregularly triangular, a little longer than wide, contiguous in their distal half and separated from each other in their proximal region. The proximal corner is round. Their length is less than a half-radius of the disc.

The combs are formed of large papillae, short and round. Four or five are visible on the dorsal surface. They are continuous in diminishing size the length of the genital slit.

The plates that cover the ventral surface of the disc in the interbrachial spaces are large and irregularly polygonal. The genital plates are large and wide.

The buccal shields are large, a little wider than long with a convex distal border that is connected by round corners to the lateral sides that are straight. The proximal corner is sharp. The adoral plates are long and narrow, four or five times longer than wide. The oral plates are two or three times longer than wide. There are five buccal papillae on each side. They are wider than tall. All have the same height. The separating lines are barely visible. The unpaired terminal papilla is barely elevated.

The arms are extremely thin. The first dorsal brachial plates are very small, with a convex distal border. The second, contiguous with the first, is large and a little longer than wide. It has a very narrow proximal side, two concave lateral sides and a very wide and convex distal border. The third plate, separated from the preceding, is triangular with a sharp proximal corner and a convex distal border. The following ones have the same form as the third but they become much smaller.

The first ventral brachial plate is large and triangular, with slightly convex sides and round angles. The second is pentagonal. The two proximal sides are straight and limit a very obtuse corner. The two lateral sides are concave. The distal border is convex. The following plates are small and triangular, with a convex distal border. They are both separated from one another from the first.

Each lateral plate, protruding, has three very developed and regularly spaced spines in the middle of their distal border. The tentacle pores of the first pair are large. They have four scales on the external border and three on the internal border. Those of the second pair, much smaller, have three external scales and two internal scales. The following, very reduced usually only have one of them.

The individual from which I described *O. inflata* is evidently young, as indicated by the depressions that separate the dorsal plates from the disc. It has nevertheless very clear characters so that it is impossible to refer it to any known species. It is very near *O. tenera* Lyman. It differs from it by the remarkable narrowness of the arms, the arrangement of the dorsal plates of the disc and notably by the presence of a circle of interr radial plates separating the central plate from the radials, by the width of the buccal shields, by the number of tentacle scales and, finally, by the form of the dorsal and ventral brachial plates.

OPHIOGLYPHA PAUPERA, K  HLER.
(Pl. IV; fig. 33, 34 and 35)

1897.—*Ophioglypha paupera*, K  hler (3) p. 290; pl. V., fig. 12 and 13.

Laccadive Islands. Long. E. 72° 40' 20". Lat. N. 10° 47' 45". Depth: 705 fathoms. Three specimens.

Coast of Malabar. Long. E. 75° 36' 30'. Lat. N. 9° 34' 57". Depth: 406 fathoms. Three specimens.

Diameter of the disc in the largest specimen: 6 millimeters, length of the arms: 13 millimeters; width of the arms at the base: 9.3 millimeters.

The disc is pentagonal, very thick slightly depressed in the central part and a little taller toward the periphery. The dorsal surface has a large central plate with a pentagonal contour, surrounded by a circle of ten smaller plates, five radials and five interradians. Outside, we find in each radius a very large pentagonal plate. It has a distal corner that is sunken between the two radial shields. These are large, pentagonal and contiguous for a large part of their length. In each interradian space is a row of four plates. The first belongs to a circle that surrounds the centrodorsal. Its dimensions increase toward the periphery of the disc. The very large last two fill at the periphery of the disc the entire interval between the radial shields.

The radial scales are triangular. The combs are formed of very long, tight papillae, round at the end. We distinguish twelve to fifteen of them on the dorsal surface.

The ventral surface of the disc is entirely filled, in each interbrachial space, by the buccal shield, without another plate. The genital plates are barely visible. They have one series of undeveloped papillae.

The buccal shields are very large. They have a proximal corner limited by two short, straight sides and two lateral sides connected by round corners to the distal border that is slightly concave. The adoral plates are pear-shaped. The internal side, adjacent to its congener, is straight. The proximal corner is sharp and the distal border round and convex. The oral plates are elongated. They have a straight internal side and a round distal border. The two proximal and distal borders are parallel. These plates are narrower than the adoral plates. Each has six to seven low buccal papillae, square and very tight. The lines of demarcation are barely distinct or even completely effaced between the external papillae. The unpaired terminal papilla is triangular and barely larger than the others.

The first four dorsal brachial plates are contiguous. The first is small, elongated transversely. The three following, very large, have a straight proximal border, two very divergent lateral sides and a wide and convex distal border. After the fourth, these plates are no longer contiguous and become triangular with a strongly convex distal border. Their dimensions decrease very rapidly.

The ventral brachial plates are separated from each other from the base of the arms. The first is pentagonal, a little longer than wide, with a straight proximal side and a round distal corner. The second, third and fourth plates are also pentagonal, but with a proximal corner and a distal border slightly curved. They are as long as wide. The following ones decrease their lateral sides and become wider than long with a strongly convex distal borders.

The lateral plates are taller than wide and hexagonal. Each has three conical spines, thin, very short, regularly spaced on the distal border, subequal and reaching a third the length of the article. We frequently see four on the first articles and only two on later articles.

The first pore pair is between the oral plates, adorals and the first ventral brachial plate. They have four scales on the internal border and three on the external border. Those of the second pair have three or four scales inside and three outside. The pores of the third and fourth pairs have two or three of them on each side. Beyond, we find only one scale.

All the plates of the disc and arms, as well as the buccal plates have round and very distinctive granules.

O. paupera is very near *O. convexa* that it approaches by the form of the buccal pieces, the number of brachial spines, etc. But it is easily distinguished from it by the arrangement of the dorsal plates of the disc that is completely different in the two species.

OPHIOGLYPHA SORDIDA, K  HLER. (Pl. V; fig. 39, 40 and 41)

1897. *Ophioglypha sordida*, K  hler (3) p. 292; pl. V., fig. 14 and 15.

Andaman Islands. Long. N. 92  36". Lat. N. 13  37'30". Depth; 561 fathoms. A single specimen.

Diameter of the disc: 8 millimeters; thickness of the disc: 3 millimeters; width of the arms at the base: 2 millimeters. The arms are broken at 13 millimeters from the base.

The disc is circular and very thick. The dorsal and ventral surfaces are flat. The central region of the dorsal surface is filled with numerous small imbricated scales, among which we distinguish a large rounded central plate. The radial shields are very large and pentagonal with rounded corners. They are contiguous for a large part of their length and separated inside by a triangular plate, larger than the other plates in the middle of the disc. Between the radial shields, each interradial space is filled, at the periphery of the disc, by a single large plate as large as the radial shields. The ten radial shields and the five large interradial plates form at the periphery of the disc a continuous border, a kind of ring a littler thicker than the central region that is slightly depressed. The combs are formed of long, fine, tight teeth that continue in the form of small papillae along the genital slit that is very narrow

The lateral surfaces (vertical) of the body are filled by a single large, square plate, bordered above by the large marginal interradial plate and below by the buccal shield.

The ventral surface of the disc is entirely filled in the interbrachial spaces by the radial shields. The genital plates are very narrow.

The buccal shields are very large, triangulated and slightly trifoliate. They have a very broad proximal corner, a wide and slightly convex distal border, rounded external borders and lateral sides that are more or less concave in their proximal part. The adoral plates are large and quadrangular. The oral plates, smaller than the preceding, are pear-shaped. There are six buccal papillae. The first is conical and pointed. The others are short, square and contiguous on all their height of their lateral borders. The unpaired terminal papilla is conical and a little larger than the adjacent one.

The arms are thick and strong. The first dorsal brachial plate is small, as wide as long, with a round distal border. The following ones are hexagonal. Their dimensions decrease after the

second that is that is very large. After the fifth, they are no longer contiguous and become lozenge-shaped.

The first ventral brachial plate is very large and lozenge shaped. The second, which is contiguous with the first, is very large and pentagonal, much larger in the distal part than in the proximal part. It has a broad proximal corner, with concave lateral sides and a convex distal border. After the second, the ventral brachial plates are no longer contiguous. The third and fourth have the same form as the second, but they are much smaller. The others are triangular with a broad proximal corner and a convex distal border.

The lateral plates are hexagonal, two times taller than wide. They have three extremely short spines, inserting at equal distances along their distal border.

The tentacle pores are large. Those of the first pair have four or five scales on each side. Those of the second pair have three of them outside and three or four of them inside. The third has three on each side. The fourth and fifth have two outside and two or three inside. The following ones have no more than one.

The plates of the disc and the arms have round granules as in *O. paupera*.

O. sordida is close to *O. paupera*. It has, as the latter, at the dorsal surface of the disk a marginal border formed of ten radial shields and five large interradial plates, very large buccal shields covering all the interbrachial space of the ventral surface of the disc and three brachial spines. It is distinguished, at first glance, by the numerous imbricated plates that cover the middle of the dorsal surface of the disc. The dorsal brachial plates are larger than in *O. paupera*. The ventral plates also have a different form in the two species. The papillae of the radial combs are wider, shorter, less pointed and less numerous in *O. paupera* than in *O. sordida*. To the contrary, the brachial spines are shorter in the latter species than in the first.

OPHIOGLYPHA INVOLUTA K  HLER.

(Pl. VIII; fig. 61, 62 and 63)

1897. *Ophioglypha involuta*, K  hler (3) p. 295; pl. VI, fig. 16, 17 and 18.

Bay of Bengal. Long. N. 88  52'17". Lat. N. 11  58'. Depth: 1,748 fathoms. Two specimens.

Diameter of the disc: 22 millimeters in the largest specimen and 20 in the smallest; width of the arms at the base: 4 millimeters. The arms are broken at 8 centimeters from the base.

The disc is circular, slightly indented at the base of the arms. The dorsal surface, slightly swollen, is covered with numerous imbricated plates of irregular form with round contours, unequal, a little larger toward the periphery. The primary plates are not distinct. The radial shields are small, irregularly rounded or triangular, as wide as long. They are 3 millimeters in their two dimensions in the large specimen. They are far apart and separated by two or three rows of plates. The combs are formed of large papillae, short and round, that continue along the genital plate where they are very flat, much wider than tall.

The ventral surface is covered, in the interbrachial spaces, with imbricated plates larger than on the dorsal surface.

The buccal plates, very large, are a little wider than long. They have a proximal corner between two straight sides and a round distal border. The external corners are also round. The

adoral plates are very elongated, four times longer than wide and narrow in the external part contiguous to the buccal pores. Their borders are parallel. The oral plates also have parallel borders. They are two times longer than wide. There are eight, sometimes nine, buccal papillae on each side. They are very tight, more or less irregularly rectangular and small. The unpaired terminal papilla and the two adjacent papillae are larger than the others and lanceolate.

The first two dorsal brachial plates are very narrow and located in the notch of the arms. The third is taller, but it is still three or four times wider than long. The following plates are trapezoidal, with a concave proximal border, a convex distal border and straight and divergent lateral sides. The third, fourth and fifth plates are wider than long. The following ones are as long as wide. Then finally they become longer than wide.

The first ventral brachial plate is large, oval and elongated transversely. The following ones are triangular, much wider than long, with an obtuse proximal corner and a convex distal border. They cease to be contiguous after the fourth.

The lateral plates are hexagonal and are taller than long. They have three very short, papilliform spines. The dorsal spine is separated from the other two that are contiguous by a rounded projection, a kind of lobe on the edge of the plate.

The pores of the first pair are very elongated and have eight or nine scales on their external border and six on the internal border. Those of the second pair have six to seven external scales and four internal. The third pair has five external scales and two or three internal. The fourth has four external and two internal. The two or three following pairs have three scales on the proximal, then two only.

O. involuta is very close to *O. irrorata* and *orbiculata*. It is immediately separated from them by the arrangement of the brachial spines. It is distinguished from *O. irrorata* by the radial shields as long as wide, by the buccal papillae and the more numerous tentacle scales, by the shortness of the radial shields and by the form of the ventral brachial plates. *O. involuta* is closer to *O. orbiculata*, but independently of characters taken from the brachial spines, the number of tentacle scales is different in the two species and *O. involuta* has stronger and more distinct plates of the disc than *O. orbiculata*.

OPHIOGLYPHA ÆQUALIS, LYMAN. (Pl. V; fig. 38)

1878. — *Ophioglypha æqualis*, **Lyman** (7) p. 72; pl. III, fig. 74 and 75.

1882. — *Ophioglypha æqualis*, **Lyman** (8) p. 46; pl. IV, fig. 14 and 15.

1897. — *Ophioglypha æqualis*, **Kœhler** (3) p. 297; pl. VI, fig. 19. ...17...

1. Minicoy (Laccadive Islands). Depth: 1,200 fathoms. Several specimens.

2. Andaman Islands; 7 and a half miles east of North Cinque Island. Depth: 490 fathoms. One specimen.

In the largest specimens, the diameter of the disc reaches 12 millimeters.

The description that Lyman has given of this species is very complete and my specimens absolutely refer to it. It is rather curious that in the only figure he gives of this species and that represents the base of the arm, this scholar has omitted to indicate the characteristic arrangement of *O. æqualis*. I want to speak of the double radial comb. The first two dorsal brachial plates found

in the disc have, in fact, toward their lateral borders, a row of very small papillae that form a kind of supplementary comb.

The disposition of the dorsal plates has been indicated in a rather brief manner by Lyman. In the absence of a figure, it is rather difficult to understand the arrangement. Here is what I observe in my specimens. The dorsal plates are very numerous, irregular in form, round and imbricated. They are a little larger at the periphery than at the center. The central plate is very distinct from the others. At a very great distance from this plate is, in each radius, a round plate, larger than the adjacent ones, located nearly at the place where the points of the radial shields from which it is separated by one or two plates. The radial shields are elongated, pear-shaped, two times longer than wide. Their length is equal to half the radius of the disc. The interradii spaces are filled by several rows of plates, among which we distinguish a larger median row.

Lyman says that *O. æqualis* is distinguished from *O. lepida* by the form of the dorsal brachial plates and the brachial spines. I shall add that, to judge from the figures that he gives of *O. lepida*, the dorsal plates of the disc are larger and less numerous in this latter species than in *O. æqualis* and that the papillae of the comb are also longer and less numerous than those of the principal comb of *O. æqualis*.

There are normally five brachial spines and it not rare to find six of them on the first articles of the arms in some specimens.

The type studied by Lyman was captured by the "Challenger" to the north of New Guinea at a depth of 1,070 fathoms.

OPHIOGLYPHA PALLIATA LYMAN.

1878. — *Ophioglypha palliata*, **Lyman** (7) p. 69; pl IV, fig. 98, 99 and 100.

1882. — *Ophioglypha palliata*, **Lyman** (8) p. 43; pl. IV, fig. 4, 5 and 6.

1897. — *Ophioglypha palliata*, **Køhler** (3) p. 298.

Maldiv Islands. Long. E. 75°46'. Lat. N. 7°5'45'. Depth: 719 fathoms. One specimen.

Diameter of the disc: 14 millimeters; the arms are broken at 7 centimeters from the base.

The specimen corresponds nearly exactly to the description of Lyman. The only difference that I note concerns the number of tentacle scales. The first pair of pores has six or seven scales on each border. The second and third have six outside and three or four inside. The fourth pair has four and the following two or three pairs have three on the external or proximal border while the internal or distal border lacks them. The following pores have only two scales.

O. palliata was discovered by the "Challenger" off the coast of Sydney at a depth of 400 fathoms.

OPHIOGLYPHA FLAGELLATA LYMAN.

1878. — *Ophioglypha flagellata*, **Lyman (7)** p. 69; pl. II, fig. 49, 50 and 51.
1882. — *Ophioglypha flagellata*, **Lyman (8)** p. 42; pl. IV, fig. 16, 17 and 18.
1897. — *Ophioglypha flagellata*, **Køhler (3)** p. 299.

1. Andaman Islands; 7 and a half miles east of North Cinque Island. Depth: 490 fathoms. Seven specimens.
2. Andaman Islands; Long E 92° 47' 6". Lat. N. 12° 25' 5". Depth: 405 fathoms. Five specimens.
3. Off the coast of Colombo. Long. E. 79° 37'. Lat. N. 6° 32'. Depth: 675 fathoms. A small specimen.

In the largest specimens, the diameter of the disc reaches 24 millimeter and the length of the arms exceeds 8 centimeters. Their width at the base is 5 millimeters.

In comparing these specimens to the type described and figured by Lyman, I observe that the buccal shields have a distal lobe more protruding, narrower and, consequently, more distinct. The buccal papillae can be more numerous than Lyman indicates and reach eight or nine. These papillae are moreover very small and more or less fused by their borders. Finally, the radial combs have finer and more numerous teeth in my specimens than in the figure of Lyman. These differences are completely secondary.

O. flagellata was discovered by the "Challenger" between the Philippine Islands and the Carolina Islands at 340 fathoms.

OPHIOGLYPHA UNDULATA LYMAN.

1878. — *Ophioglypha undulata*, **Lyman (7)** p. 75; pl. III, fig. 61 and 62.
1882. — *Ophioglypha undulata*, **Lyman (8)** p. 49; pl. V, fig. 10, 11 and 12.
1879. — *Ophioglypha undulata*, **Køhler (3)** p. 299.

1. Off the coast of Colombo. Long. E. 79° 37'. Lat. N. 6° 32'. Depth: 675 fathoms. Three specimens.
2. Laccadive Islands. Long. E. 71° 21'. Lat. N. 14° 22'. Depth: 1,132 fathoms. Three specimens.

The diameter of the disc is 8 to 9 millimeters.

I refer these specimens to *O. undulata* although they are separated by some characters from the description of Lyman. The buccal shields are as wide as long and the ventral brachial plates are separated from the base of the arms. The first two alone are sometimes contiguous. In the three specimens from Colombo and in one from the Laccadives, the radial shields conform to the description of Lyman. They are short, round, as wide as long and separated inside by a single plate.

The other characters compare so exactly to the description of Lyman that there can be no doubt about the identification of these specimens. The few differences that I raise come perhaps because they are not completely adult. The diameter of the disc is, in fact, 12 millimeters in the type of Lyman.

O. undulata was discovered by the "Challenger" around the Caroline Islands at 1,450 fathoms depth.

OPHIOGLYPHA RADIATA LYMAN.

1878. — *Ophioglypha radiata*, **Lyman (7)** p. 89, pl. III, fig. 65 and 66.

1882. — *Ophioglypha radiata*, **Lyman (8)** p. 64, pl. VII, fig. 1, 2 and 3.

1897. — *Ophioglypha radiata*, **Kœhler (3)** p. 300.

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Minicoy Island. Depth: 1,200 fathoms. A single specimen.

The disc has a diameter of 9 millimeters.

The specimen conforms to the description of Lyman, but the ventral brachial plates are separated beyond the second.

The type of the species was dredged by the "Challenger" east of the Philippine Islands at a depth of 1,050 fathoms.

OPHIOGLYPHA SCULPTILIS LYMAN.

1878. — *Ophioglypha sculptilis*, **Lyman (7)** p. 84, pl. IV, fig. 115 and 116.

1882. — *Ophioglypha sculptilis*, **Lyman (8)** p. 51, pl. VI, fig. 16, 17 and 18.

1897. — *Ophioglypha sculptilis*, **Kœhler (3)** p. 301.

1. Bay of Bengal. Long. E. 90° 52'. Lat. N. 12° 50'. Depth: 1,614 fathoms. Two specimens.

2. Bay of Bengal. Long. E. 85° 8'. Lat. N. 12° 20'. Depth: 1,803 fathoms. Nine specimens.

All the specimens have nearly the same dimensions. The diameter of the disc fluctuates around 15 millimeters. They have some variation that regard the arrangement of the plates of the disc and the number of brachial spines. In some specimens, the primary plates are very large, nearly as large as the radial shields, while in others, they are extremely reduced. The interradial plates have similar differences. The vertical surfaces of the disc, between the arms, are nearly always filled by two large plates contiguous with the radial scales. A single specimen has a single vertical plate in four interradial spaces and two in the fifth space.

The number of brachial spines varies in rather narrow limits. In some specimens, I have found eight at the base of the arms and then seven and six or even only five. But it is not rare to observe seven spines on articles preceded and followed by articles with six spines. Other specimens have only six or seven spines on the first articles of the arms.

In all the specimens, the buccal shields are larger and fill a portion of the interbrachial spaces of ventral surface, sensibly more extended than in the type of Lyman.

The buccal papillae are small, all the same height and arranged in a very regular row. The radial shields are separated inside by several plates. These are the two principal characters that permit distinguishing *O. sculptilis* from *O. variabilis* that is extremely close. Actually, these characters are not of very great value. Nevertheless, it is interesting to note that, in the specimens that have the variations I just mentioned, they are preserved with a constancy that justifies the specific separation established by Lyman.

The type of Lyman comes from the coast of Japan where it was captured by the “Challenger” at 1,875 fathoms depth.

OPHIOGLYPHA ORBICULATA LYMAN.

1878. — *Ophioglypha orbiculata*, **Lyman**, (7) p. 74; pl. III, fig. 103, 104 and 105.

1882. — *Ophioglypha orbiculata*, **Lyman**, (8) p. 43; pl. VIII, fig. 10, 11 and 12.

1897. — *Ophioglypha orbiculata*, **Kœhler**, (3) p. 302.

Bay of Bengal. Long. E. 88° 52'. Lat. N. 11° 58'. Depth: 1,748 fathoms. Two specimens.

O. orbiculata and *irrorata* are not very easy to distinguish from each other. In the latter, according to Lyman, the radial shields are longer than wide and the buccal shields are wider than long, the adoral plates are wider outside and the first pair of tentacle pores have a border of five pairs of scales. All these characters are found in my specimens. They differ however from the type of Lyman by the primary plates that can be distinguished from adjacent plates by a slightly larger size.

O. orbiculata was discovered by the “Challenger” in the seas of Japan at a depth of 1,875 fathoms.

OPHIOGLYPHA IMBECILLIS LYMAN.

1878. — *Ophioglypha imbecillis*, **Lyman**, (7) p. 73; pl. III, fig. 63 and 64.

1882. — *Ophioglypha imbecillis*, **Lyman**, (8) p. 46; pl. IV, fig. 11, 12 and 13.

1897. — *Ophioglypha imbecillis*, **Kœhler**, (3) p. 303.

Pointe de Galles. Long. E. 81°27'36' Lat. N. 8°40'. Depth: 800–637 fathoms. Two specimens.

The individuals are very young, the discs being respectively 3 and 2 millimeters in diameter. The cenetrodorsal plate is relatively larger and the dorsal interradiial plates are less numerous than in the type figured by Lyman. This difference incontestably comes from the young age of the subjects.

The type of *O. imbecillis* comes from the seas of Japan where the “Challenger” captured it at 340 fathoms of depth.

OPHIOMUSIUM FAMILIARE K  HLER.
(Pl. IV; 30, 31 and 32)

1897. — *Ophiomusium familiare*, K  hler, (3) p. 303; pl. VI, fig. 20 and 21.

Coast of Malabar. Long. E. 75°36'30". Lat. N. 9°34'57" - Depth: 406 fathoms. About ten specimens.
Maldiv Islands. Long. E. 75°4'. Lat. N. 7°5'45", Depth: 719 fathoms. One specimen.

Diameter of the disc of the largest specimen: 17 millimeters; length of the arms: 45 millimeters; width of the arms at the base: 2.5 millimeters.

The disc is small and round. The dorsal surface is covered with small plates, round or polygonal, irregular, among which we see six primary plates larger than the others, round, the radials widely separated from the central plate. The radial shields are large, round, oval, one and half times longer than wide. Their length is hardly less than a half-radius of the disc. They are separated by one or two rows of polygonal plates. Beyond these is a series of rectangular plates, much wider than long, generally four in number and before the first dorsal brachial plate. In the interradial spaces are three large plates and, on each side, a series of smaller plates.

The radial scales and their papillae forming the combs are replaced by several small round plates, arranged in two or three successive rows outside the radial shield, on each side of the base of the arm. On the ventral surface, these plates are continued by a very regular row of papillae that extend the entire length of the genital slit. The ventral surface of the disc is filled, in the interbrachial spaces, by numerous small polygonal plates of unequal sizes. The genital slits are very long as well as the genital plates.

The buccal shields are small, lanceolate-like, longer than wide, widened in the middle and narrow in the distal region. They have a sharp proximal corner and a small, straight distal border. The adoral plates are large, elongated, widened in their external region with large parallel borders. The oral plates are small, triangular and tall. They extend by their base onto a part of the length of the adoral plates. There are eight buccal papillae on each side. The five or six terminal ones are short and round. The others are narrow and pointed. The unpaired terminal papilla is hardly larger than the adjacent ones.

The dorsal brachial plates are small, but they extend to the end of the arm. The first is pentagonal, wider than long. The following ones are triangular with a proximal corner and a convex distal border. They are separated from each other from the beginning.

The first ventral brachial plate is small and lozenge-shaped. The four following are large, with an obtuse proximal corner, lateral sides notched by the tentacle pores and a slightly round distal border. After the fifth, they become smaller and triangular. They are separated from the beginning.

The lateral plates are tall. They have five spines located equidistant from each other, very small and papilliform.

Tentacle pores are found on the first three articles of the arms. Each of them is covered by a large round scale. On the first pair are found two smaller scales.

In very young specimens, the arrangement of the dorsal plates is interesting. In a specimen whose disc is 6 millimeters in diameter, I see a centrodorsal plate surrounded by five primary radials that are contiguous. The interradial spaces are filled by three large plates. The radial shields are separated by only two plates. Outside each shield we see only a single plate lacking papillae.

O. familiare is close to *O. eburneum* Lyman. It is distinguished from it by the number of brachial spines (five instead of two) and by the presence of tentacle pores on the first three articles of the arms.

OPHIOMUSIUM ELEGANS KÖHLER.
(Pl. III; 22, 23 and 24)

1897. — *Ophiomusium elegans*, Köhler (3) p. 305; pl. VI, fig. 22 and 23.

1. — Coast of Malabar. Long., E. 75°36'30". Lat. N. 9°34'57". Depth: 406 fathoms. Two specimens.
2. — Andaman Islands. 7 and a half miles east of North Cinque Island. Depth: 490 fathoms. One specimen.
3. — Andaman Islands. North Sentinel Island. Depth: 250 fathoms. One small specimen.

Diameter of the disc: 11 and 13 millimeters; length of the arms: 45 millimeters; width of the arms at the base: 2 millimeters.

The disc is flat and lenticular with a thin edge. The central part of the dorsal surface is filled with numerous small unequal plates, without round corners. Among them we distinguish, with more or less difficulty, six primary plates a little larger than the adjacent ones, the radials being separated from the centro-dorsal plate. The radial shields are large, elongated and triangular with round corners. They are two times longer than wide. Their length is a little greater than a half-radius of the disc. They are widely separated for their entire length by a row of five plates. The two proximals are square and the three others very flat. The interradial spaces are filled by three large square plates that cover them nearly entirely. We usually find at each corner of the middle plate a very small supplementary plate. Outside the radial shields, the very small radial scales have two or three rows of papillae, forming a kind of comb. Toward the external corner of the radial shield, we find some papillae similar to the preceding.

The ventral surface of the disk is covered, in the interbrachial spaces, with large, polygonal plates, among which we distinguish two or three larger median ones. The genital plate is long and has on its free border a row of short papillae. The lines separating them are not very marked. On the other side of the genital slit, similar papillae of the lateral brachial plates face the preceding ones. The buccal shields are lanceolate, two times longer than wide. They have a sharp corner and a narrow distal border. They are widened in the middle part. The adoral plates are large, very narrow inside and wide outside. The oral plates, very large, are triangular and elevated. There are six to seven buccal papillae on each side. The most externals are larger than the internals. They are quadrangular or even trapezoidal, the free border being sometimes a little wider than the base. The unpaired terminal papilla is lanceolate.

The first dorsal brachial plate is small, pentagonal, as long as wide. The second is lozenge-shaped. The others are triangular and very small. They are widely separated after the first and continue to the end of the arms.

The first ventral brachial plate is small, low and pentagonal. The second is longer than wide, with a proximal corner, concave sides and a very convex distal border. The two following have

the same form, but they are as long as wide. The others are triangular and they become very small after the fifth. They are separated from the beginning and continue to the end of the arm.

The slightly protruding lateral plates have three very short spines.

The three first brachial articles have a pair of tentacle pores, each with a round scale.

O. elegans is close to *O. eburneum* Lyman, from which it is distinguished by the length of the buccal shields, by the presence of three pairs of tentacle pores, by the form of the ventral brachial plates and by the size of the plates of the disc. It is also near *O. familiare* Kœhler, from which is separated by the number of brachial spines, the size of the plates of the disc and the buccal shields and the presence of radial scales with papillae.

OPHIOMUSIUM VALIDUM LJUNGSMANN.

1871. — *Ophiomusium validum*, **Ljungsmann** (4) p. 618.

1878. — *Ophiomusium validum*, **Lyman** (6) p. 219.

1878. — *Ophiomusium validum*, **Lyman** (7) p. 114; pl. I, fig. 7, 8 and 9,

1882. — *Ophiomusium validum*, **Lyman** (8) p. 92; pl. I, fig. 1, 2 and 3; pl. XXXIX, fig. 11, 12 and 13.

1883. — *Ophiomusium validum*, **Lyman** (9) p. 246.

1897. — *Ophiomusium validum*, **Kœhler** (3) p. 307.

Sea of Oman, to the north of the Laccadive Islands. Long. E. 72°28'45". Lat. N. 15°11'. Depth: 931 fathoms. A single specimen.

The diameter of the disc is only 7.5 millimeters and the animal does not appear to be completely adult. The dorsal plates of the disc are in fact separated from each other by membranous spaces. The contours of the plates are a little different from those that Lyman has figured, without however separating it in a notable manner. The two small plates found on each side of the interbrachial plate on the ventral surface are also a little larger than in the type figured by Lyman.

The number of brachial spines varies between four and five on the first articles. The number five is more constant, then the number drops to three and to two on the following articles. Lyman attributes four brachial spines to *O. validum*. Ljungsmann says that there are four of these spines at the base of the arms and then five. In summary, the number of spines varies between four and five at the base of the arms and the diagnosis of Lyman should be modified in this sense.

OPHIOMUSIUM PLANUM LYMAN.

1878. — *Ophiomusium planum*, **Lyman** (7) p. 218; pl. III, fig. 46, 47 and 48.

1882. — *Ophiomusium planum*, **Lyman** (8) p. 99.

1883. — *Ophiomusium planum*, **Lyman** (9) p. 246.

1895. — *Ophiomusium planum*, **Kœhler** (2).

1897. — *Ophiomusium planum*, **Kœhler** (3) p. 308.

1. — Bay of Bengal. Long. E 88° 52' 17". Lat. N. 11° 58'. Depth: 1,748 fathoms. Two specimens.

2. — Bay of Bengal. Long. E. 85° 43' 15". Lat. N. 9° 34'. Depth: 1,947 fathoms. One specimen.

3. — Bay of Bengal. Depth: 1,520 fathoms. One specimen.

O. planum has a vast geographic extension. The species was discovered by the Blake in the Caribbean Sea and it has been found by the Princesse Alice in the area of the Azores. The discovery of this species in the Bay of Bengal shows that it exists equally in the Indian Ocean.

The specimens captured by the Investigator are identical to those of the Atlantic to which I have been able to compare it.

OPHIOMUSIUM SCALARE LYMAN.

(Pl. II; fig. 12 and 13; pl. III; fig. 21)

1878. — *Ophiomusium scalare*, **Lyman (7)** p. 117; pl. I, fig. 1, 2 and 3.

1882. — *Ophiomusium scalare*, **Lyman (8)** p. 95; pl. I, fig. 4, 5 and 6.

1897. — *Ophiomusium scalare*, **Kœhler (3)** p. 308; pl. VI, fig. 24 and 25.

Port Blair (Andaman Islands). Depth: 112 fathoms. Three specimens whose discs are respectively 14, 13 and 10 millimeters in diameter; in the largest, the arms are 40 millimeters wide that 2 millimeters in width at the base.

The disc is flat and low. The dorsal surface is covered with numerous round, unequal plates. In the center is the round centro-dorsal plate, surrounded by a first rosette of five small interrarial plates and a second rosette of larger radial plates, having an obtuse proximal corner that advances between the preceding and a convex distal border. A series of three rectangular plates separates the radial shields. These are oval, one and a half times longer than wide. The length is a little less than a half-radius of the disc. Between the radial shields, the interrarial spaces are filled by two large rectangular plates, outside of which is a border of small plates, protruding and very tubercular. These are continuous with three plates that form a transverse row at the base of each arm. All the plates of the dorsal surface, including the radial shields, have large, round granules that, on the central plates, are especially developed on the distal half of the plate. These granules are continuous, more or less further on the dorsal surface of the arms.

The ventral surface has, in the interbrachial spaces, a large pentagonal plate after the buccal shield. Outside are two other smaller polygonal plates. Some other plates, very small and protruding, are located at the periphery of the disc. The genital plates are large and wide. The genital slits are very short.

The plates of the ventral surface are smooth and completely lack granules.

The buccal shields are longer than wide and pentagonal. They have a sharp and very elongated proximal corner, with nearly straight lateral sides and a straight distal border. The adoral plates are very large, lanceolate, two and a half times longer than wide. The oral plates are triangular. There are six buccal papillae. They are low and rectangular. Their width decreases from the more external to the more internal. Their lines of separation are indistinct. They form a nearly continuous border. The terminal papilla is scarcely more projecting than the others.

The first dorsal brachial plate is quadrangular, with a straight proximal side, two divergent lateral sides and a convex distal side, wider than the proximal side. It is longer than wide. The following ones are smaller and triangular, with a very obtuse proximal corner and a convex distal border. They disappear toward the last third of the arms.

The first ventral brachial plate is relatively large and square. The two following ones are pentagonal, with an obtuse proximal corner, two straight lateral sides and a barely curved distal border. They disappear on the third article.

The lateral plates are slightly protruding. They have three short conical spines that approach the ventral border of the plate and are equidistant from each other.

There are only two pairs of tentacle pores, narrow, located on the first and second articles and each with a very small scale.

The determination of this species and its identification with *O. scalare* caused me a great deal of difficulty. At first I had believed I had a new species. The type described by Lyman is in fact a very young animal that has not yet acquired all its definitive characters, as is indicated by the absence of genial slits. It is thus rather difficult to compare it to adult specimens. However, most of the differences that I raise between the type of Lyman and my specimens may disappear with age. Thus the Lyman's description mentions that the buccal shields are as long as wide, the dorsal plates of the disc are few, that the dorsal brachial plates are very small and that the buccal papillae are only three in number. Now, all these characters could be modified during growth. But there is a more important difference. Lyman indicates, in fact, that the radial shields are contiguous, while I find them separated by a row of plates. Now I observe in his figures that the shields are contiguous only in a part of their length, the distal and proximal regions being separated respectively by a triangular plate that forces itself between them as a wedge. It is permitted to suppose that with growth, other plates would come to be intercalated between the radial shields and would have completely separated them.

For these reasons and with the agreement of other characters, I have come to refer my specimens to the species of Lyman instead of creating a new name. But as these specimens are not in exact agreement with the description of this author, it seems to me useful to give a complete description accompanied by figures.

I have done this all the more willingly because I note, in the description of Lyman and in the figures that he has published in the Bulletin of the Museum of Comparative Zoology (vol. V, part 7, pl. I, fig. 1–3) and in his Reports of the Challenger (vol. V, fig. 4–6), some contradictions that have not otherwise contributed to decrease my difficulty on the subject of the determination of my specimens. Thus Lyman indicates in his text three buccal papillae and it is certainly the number that is represented in the figure of the Bulletin. To the contrary, in the figure of the Report, he shows six or seven. I note a similar contradiction. Lyman indicates *three* in the text. He shows effectively *three* in the figure of the Bulletin but he shows *four* in his figure of the Report.

O. scalare was discovered by the “Challenger” in the Samoan Islands at a depth of 600 fathoms.

OPHIOTROCHUS PANNICULUS LYMAN.

1878. — *Ophiotrochus panniculus*, **Lyman**, (7) p. 129; pl. VI, fig. 158, 159 and 160.

1882. — *Ophiotrochus panniculus*, **Lyman**, (8) p. 103; pl. IX, fig. 12, 13, 14.

1897. — *Ophiotrochus panniculus*, **K  hler**, (3) p. 312,

1.—Laccadive Islands. Long. E. 71° 35' 50". Lat. N. 12° 5' 35". Depth: 865–880 fathoms. One specimen.

2.—Minicoy. Depth 1,200 fathoms. One specimen.

These specimens conform to the description of Lyman. The diameter of the disc is 6 millimeters.

O. panniculus was discovered by the “Challenger” north of New Guinea at a depth of 1,070 fathoms.

OPHIOPYREN BISPINOSUS KÖHLER.

(Pl. XII: fig. 93 and 94)

1897 — *Ophiopyren bispinosus*, Köhler, (3) p. 312, pl. VI, fig. 26 and 27.

1. — Andaman Islands, North Sentinel Island. Depth: 250 fathoms. Ten specimens.
2. — Andaman Islands. South Sentinel Island. Depth: 240 fathoms. One specimen.

Diameter of the disc: 4 millimeters; length of the arms: 30 millimeters.

The disc is flat and more or less concave in the interradial spaces. It has on its dorsal and ventral surfaces round, dense granules that completely cover the underlying plates and continue even onto the first brachial article. The radial shields are nearly completely hidden. The proximal region alone remains bare.

The ventral surface also is completely covered by granules in the interbrachial spaces. The buccal shields are triangular, a little wider than long, with a sharp proximal corner, two round external corners and a distal border slightly concave in its middle. The adoral plates are extremely long, very narrow in the inner half where they are strongly compressed between the oral plates and the buccal shields. To the contrary, they are very enlarged in their external half and extend outside the buccal shield and contribute to limit the brachial border of the genital slit. These plates have along the free border 4 or 5 strong, elongated papillae that project into the genital slit. The oral plates are elongated, wide, two and a half times longer than wide. There are six buccal papillae on each side. The two external ones on the adoral plate are large and short. The third is still wider and larger. The three internals are conical, elongated and pointed. An unpaired papilla, lanceolate, larger than the others ends the jaws. Some granules, identical to those of the disc, are seen on the buccal pieces, notably toward the distal border of the buccal shields and toward the line separating the oral and adoral plates.

The arms are relatively long and thin. The first dorsal brachial plate is large, quadrangular, in large part with granules identical to those of the dorsal surface of the disc. It is as wide as long. The very large following plates are trapezoidal with a narrow and concave proximal side, a wide and convex distal side and two divergent and straight lateral sides. They are first as long as wide and then become longer than wide. They are all contiguous.

The first ventral brachial plate is triangular, a little wider than long. The following ones are rectangular, longer than wide, with a narrower proximal side and a wider distal side. They have, in their middle, two oblique lines that unite on the median line in forming an obtuse corner and that divides each plate into two parts of which the proximal is a little longer than the other.

The lateral plates do not completely reach the distal border of the dorsal plates on the dorsal surface. Each has two unequal spines. The upper one is a little larger. On the first articles, these

spines have the length of two articles, but they then become small and do not exceed the length of the article.

All the brachial plates have on their surface parallel transverse lines that make a peculiar striped appearance.

The tentacle pores are large. Each has two scales. The scales of the first pair are large and round. There is an internal one and an external one. After the second pair, the scales greatly elongate and become narrow and pointed. They are oriented parallel to each other, following the axis of the arm.

O. bispinosus is easily distinguished from *O. brevispinus* Lyman and *O. longispinus* Lyman that have three brachial spines. The constitution of the buccal apparatus is interesting in that the adoral plates are not completely outside the oral plates as in these two species. The more important, wider portion of these plates is located outside the orals. But there is nevertheless a very narrow part that is insinuated between the buccal shields and the oral shields. It joins the congeneric plate at the median line. This arrangement conforms to that which exists in the other ophiuroids. In this respect, *O. bispinosus* thus forms a transition between these ophiuroids and *O. brevispinus* and *longispinus*.

The genus *Ophiopyren* was known until now only by two species, both living in the depths. *O. brevispinus* coming from the Fiji Islands (300 fathoms) and *O. longispinus* from the Antilles (390–450 fathoms).

OPHIOLYPUS GRANULATUS K  HLER (Pl. VII; 55, 56 and 57)

1897.— *Ophiolypus granulatus*, **K  hler (3)** p. 315; pl. VI, fig. 28 and 29.

Port Blair (Andaman Islands). Depth: 112 fathoms. Two specimens.

Diameter of the disc: 7.5 millimeters; length of the arms: 13 millimeters; width of the arms at the base: 1.2 millimeters.

The disc is pentagonal, flat and very thick. It is covered, as well as the arms, with a thick integument with round granules that completely hide the underlying plates. The radial shields, small and oval, make a slight projection.

The genital slits, narrow, elongated and straight, have a row of very regular granules on each surface.

The buccal shields are small and oval, a little longer than wide. The adoral plates are pear-shaped, elongated and narrow inside. The oral plates are large and triangular. The buccal papilla, five on each side, are large and wide and form a wide border where the edges of the papillae are inconspicuous. The conical terminal papilla is a little larger.

The dorsal brachial plates are small and triangular, with a proximal corner with concave sides and a convex distal border. The first is a little larger than the others and contiguous with the second. The following ones are separated and become very small after the fifth. The first ventral brachial plate is large and square with rounded corners. The second, third and fourth are longer

than wide with a proximal corner of two short sides, two concave lateral sides and a wide, convex distal border. The following ones are lozenge-shaped or triangular and very small. All these plates are separated after the first. The lateral plates are large and slightly protruding. They have two small, very short papilliform spines that appear on the fourth article. The fifth, sixth and seventh articles generally have three spines.

Tentacle pores occur on each side of the second, third and fourth ventral brachial plates. The first two pairs have one external scale and two internal ones. The pores of the third pair have one scale on each border.

O. Agassizii, which is the type of the genus *Ophiolypus*, was discovered by the "Blake" in the Caribbean Sea at 118 fathoms. Lyman described it after an individual whose disc was 18 millimeters in diameter. *O. granulatus* differs by having three pairs of tentacle pores, by the oval radial shields, by the form of the buccal shields, of adoral plates and the ventral brachial plates, and finally, by the presence of brachial spines on the fourth article.

OPHIERNUS ADSPERSUS LYMAN.

1883. — *Ophiernus adpersus*, **Lyman** (9) p. 236; pl. III, fig. 19, 20 and 21.

1897. — *Ophiernus adpersus*, **Köhler** (3) p. 316.

1. Andaman Islands. 7 and a half miles east of North Clnque Island. Depth: 490 fathoms. Two specimens.

2. Andaman Islands. Long. E. 93° 23' 10." Lat. N. 12° 59'. Depth: 683 fathoms. Two specimens.

3. To the S. W. of Cape Comorin. Long. E. 75° 4.' Lat. N. 7° 5' 45." Depth: 719 fathoms. Several specimens.

4. Cape Comorin. Depth: 1,043 fathoms. Two specimens.

5. Bay of Bengal. Long. E. 85° 43' 15." Lat. N. 9° 34.' Depth: 1,997 fathoms. One small specimen.

The specimens relate in a very sufficient manner to the description of Lyman. The few differences that I note are the following. The notches of the disc at the base of the arms are a little deeper and the projection of the interbrachial parts is a little stronger than indicated by the figures of Lyman. The ventral brachial plates have, in the Indian Ocean specimens, a proximal corner elongated and narrowed in the form of a small lobe between the lateral plates, an arrangement that Lyman does not report. The two tentacle scales, inserted on the proximal border of each pore, are found on the first two or three articles. They then become oval, then lanceolate and pointed outside the disc. In the descriptions that he published on *O. adpersus* Lyman insists on the width of the base of the arm. In the characteristic that he gives of the species, he says that the width of the basal part of the arm is equal to a third of the diameter of the disc. Now, in the specimen that he described, the arms are 4 millimeters wide at the base and the disc has a diameter of 13 millimeters while, to judge from his figures, the relation would be 1/4 only. For my part, I observe that in a specimen with a disc diameter of 20 millimeters, the arms have a width exactly 5 millimeters at the base.

OPHIOCERAMIS TENERA K  HLER.
(Pl. V; fig. 42 and 43).

1897. — *OphioceramIS tenera*, K  hler (3) p. 317; pl. VI, fig. 30 and 31.

1. Laccadive Islands. Long. E. 73   7.' Lat. N. 13   47' 49." Depth: 636 fathoms. One specimen.
2. Andaman Islands. Depth: 265 fathoms. One specimen.

Diameter of the disc: 5.5 millimeters; length of the arms: 17 millimeters.

The disc is flat, very thick, strongly notched in the interradial spaces. The dorsal surface is covered in sparse plates, round, unequal and separated by large spaces. It is impossible to distinguish the primary plates. The radial and interradial plates are irregularly distributed, the largest being separated by smaller plates. The radial shields are remarkably large. They form a considerable projection at the periphery of the disc. They are elliptical, elongated, two times longer than wide. Their width is greater than a half-radius of the disc. They are separated their entire length by a row of three large plates, of which the two proximal ones are round. The distal plate is very enlarged. The radial shields are, to the contrary, much nearer to each other in the interradial space that has only a single narrow and elongated plate. By their form, dimensions and the marked projection that they make, these shields recall *O. obstricta* Lyman.

On their ventral surface, the very narrow interbrachial spaces are filled by some small plates and outside by two plates limiting the border of the genital slit. The proximal plate is shorter than the following that is elongated. The genital slits are simple.

The buccal shields are rather small, triangular, wider than long, with a sharp proximal corner and a slightly convex distal border. The adoral plates are very large, thick, in the form of a croissant, two times longer than wide, with a wide and round external border and a sharp internal and proximal corner. The small oral plates are triangular and low. Each side has three large and wide buccal papillae, with a free irregular border and an unpaired conical and elongated papilla.

The first dorsal brachial plate is transversely elongated, two times wider than long. The proximal border is congruous all along its length with the large peripheral radial plate. The distal border is very convex. The following plates are triangular, with a proximal corner and a convex distal side. They rapidly become smaller and they are all separated from each other.

The first ventral brachial plate is relatively large and triangular, with round corners and borders. They are as long as wide. The following ones are very small, nearly semi-circles, with a very open proximal corner and a strongly convex distal border. They are widely separated from each other.

The lateral brachial plates are very developed, largely contiguous on the dorsal and ventral median lines. They have three unequal spines, a little shorter than the article. There is only one tentacle scale, short, conical and strong.

O. tenera approaches *O. obstricta* Lyman by its very large radial shields and by the arrangement of the buccal pieces. It is separated from it by the number of brachial spines, by the arrangement of the plates of the disc and by the form of the dorsal and ventral plates.

OPHIOZONA BISPINOSA K  HLER.
(Pl. II; fig. 10 and 11)

1897. — *Ophiozona bispinosa*, K  hler (3) p. 319; pl. VI, fig. 32 and 33.

Port Blair (Andaman Islands). Depth: 112 fathoms. Three specimens.

Diameter of the disc of the largest specimen: 12 millimeters; width of the arm at the base: 2 millimeters; length of the arm is greater than 40 millimeters.

The disc has the form of a flat-convex lentil. The dorsal surface, slightly raised, has in its center a round plate surrounded by a circle of small scales. Outside are five large primary radial plates separated by as many interradi  l plates nearly as large. After these first, we find a row of four plates that separate the radial shields. The first two are large and elongated. The last two are, to the contrary, wide and very short. The interradi  l spaces are filled by a principal series of three plates, each side of which has a row of smaller plates. The radial shields are large and triangular, with round corners and sides. Their length, which is scarcely greater than their width, is shorter than a half-radius of the disc. They are widely separated all along their length.

The ventral surface of the disc is filled, in the interbrachial spaces, by irregular polygonal plates. About six larger plates are found at the periphery. The genital plates are large and wide. The genital slits are very narrow.

The buccal shields are a little longer than wide. They have a proximal corner limited by two straight sides, notched lateral sides at the proximal end of the genital slit and are joined by round corners at the distal border, which is equally round and narrow. The adoral plates are triangular, two times longer than wide, larger outside than inside. The oral plates are low. There are five buccal papillae on each side. The three external ones are quadrangular and round. The two others are pointed. The terminal papilla is not much larger than the adjacent ones.

The first dorsal brachial plate is quadrangular, wider than long. The others are very large, lozenge-shaped limited by the contiguous slightly curved sides.

The first ventral brachial plate is small and triangular, with a distal corner. The following ones are large, lozenge-shaped, with the borders slightly concave and the proximal and broad distal corners. Beyond the disc, the distal corners become more and more obtuse and the plates become triangular. They are all contiguous.

The lateral plates, slightly protruding, have each two spines. The lower one is equal to the article. The upper one is longer.

The tentacle pores have each two round scales, rather large, that exist all along the length of the arms.

O. bispinosa is distinguished from all known species by the coexistence of two brachial spines with two tentacle scales. It is especially near *O. tessellata* Lyman, which has three brachial spines and whose tentacle scales are found only on the first articles of the arms.

OPHIOPEZA CUSTOS K  HLER.
(Pl. III; fig. 29 and 26)

1897 — *Ophiopeza custos*, K  hler (3) p. 321; pl. VI, fig. 34 and 35.

Andaman Islands. 8 miles to the west of Interview Island. Depth 270–45 fathoms. A single specimen.

Diameter of the disc: 7 millimeters; length of the arms: 60 millimeters; width of the arms at the base: 1.2 millimeters.

The disc is flat, pentagonal, not notched at the base of the arms. The dorsal surface is covered with very small scales that, in the living animal, are completely hidden under fine and dense granules. These have nearly disappeared. We see only a few toward the periphery. These granules are, to the contrary, integrally preserved on the ventral surface that is entirely covered with them with the exception of the buccal pieces. The radial shields are small, very separate from each other, triangular, two times longer than wide.

The buccal shields are oval, one and a half times longer than wide. The adoral plates are elongated, narrow, tapered in the internal region, enlarged, to the contrary, in the external region. The oral plates are triangular and small. There are five buccal papillae on each side. The most external is low and small. The second is large and widened. The three internals are narrow, conical and pointed. The terminal papilla is large and conical.

The buccal shields are oval, one and a half times longer than wide. The adoral plates are elongated, narrow and small in the internal enlarged region in contrast to the external region. The oral plates are triangular and small. There are five buccal papillae on each side. The most external is low and small. The second is large and wide. The three internal ones are narrow, conical and pointed. The unpaired terminal papilla is large and conical.

The first dorsal brachial plate is small, much wider than long, with a round distal border. The following ones are quadrangular, wider than long. The proximal side is narrow and concave. The two lateral sides are straight and divergent. The distal border is wide and convex. They are all contiguous.

The first ventral brachial plate is very small, triangular and semicircular. The second is quadrangular, wider than long, contiguous with the first the entire width of its proximal border. The following ones are pentagonal with a proximal corner, two concave lateral sides and a widened, slightly convex distal side. They are also wider than long and are separated from each other beyond the disc by a very short space.

The lateral plates do not protrude. They have three spines. The two upper ones are equal and a little longer than the article. The lower one is shorter than the others. These spines are rather large, wide and obtuse at the end.

The tentacle pores have a very large scale, round or oval. On the first article, there is a second much smaller internal scale.

O. custos is distinguished from other species of the genus by its three brachial spines.

The depth at which *O. custos* was collected by the “Investigator” being 270 and 45 fathoms, it is possible that this form is sublittoral.

PECTINURA CONSPICUA K  HLER.
(Pl. II; fig. 14 and 15.)

1897. — *Pectinura conspicua*, K  hler (3) p.322 ; pl. VI, fig. 36 and 37.

Godavery delta. Long E. 81° 25'. Lat. N. 16° 01'. Depth: 410 fathoms. Several specimens.

This ophiuroid is among the largest known species. In most of the specimens, the disc is greater than 35 millimeters. In some it reaches even 40. The length of the arms is 18 to 20 centimeters. Their width at the base is 6 millimeters.

The disc is flat, pentagonal and even slightly concave in the interbrachial spaces. It is very strongly notched at the base of the arms. the dorsal surface is uniformly covered with fine, dense granules. When these granules are removed, we see underlying plates that are small, thin and imbricated. The peripheral plates are a little larger than the others. Notably, we see one in the middle of the interrachial space toward the border of the disc that is much larger than the adjacent ones and that is always bare. Outside it, we see likewise some small bare plates. The bare radial shields are regularly oval. Their length is less than a third of the radius of the disc. They are widely separated. Between each pair of radial shields is a radial depression that is continuous to the center.

The ventral surface in the interbrachial spaces is covered with granules identical to those of the dorsal surface but less dense. We see very easily the underlying plates.

The buccal shields are very large, triangular, wider than long, with a proximal corner limited by two slightly concave sides and a round distal border. The lateral corners are also round. The supernumerary plate, that is found outside, is small and semicircular. These shields are completely bare. The adoral plates are very elongated, strongly narrowed in their internal region and covered with granules, enlarged at their extreme end that is bare. The oral plates are low and small, likewise covered with granules. There are six to seven buccal papillae on each side. The most external is very large and wide. The two following are as long as wide, with a round free border. The others are conical and pointed. The terminal unpaired papilla is large and conical.

The first dorsal brachial plates, generally four, are in the notches of the arms. They are smaller than the others that are large, quadrangular, much wider than long. The lateral borders are slightly divergent and the two large borders are straight. These plates covering all the dorsal surface of the arms do not reach the lateral plates. They are very strong, very tall and square so that a section of the arm has the form of a triangle.

The first ventral brachial plate is small and trapezoidal, with a round and wide proximal border, a narrow distal border and concave lateral borders. The other plates, wider than long, have a narrow proximal side, two divergent lateral sides notched by the tentacle pores and a very wide and convex distal border.

The lateral plates are small, developed only on the ventral side. They have three spines (often a fourth on the first ten articles) larger than half the article, thin and pointed.

The tentacle pores have a large round scale. It is found often on the first pair and sometimes even on the second pair. In addition, we generally see five pairs of fine pores between the ventral brachial plates. This number does not appear to be absolutely constant. Some specimens have only three or four visible pores.

P. conspicua is especially near *P. heros* Lyman, from which it differs by the presence of pores between the ventral brachial plates, by the smaller number of buccal papillae and by the form of

the buccal plates. It is easily distinguished from other known abyssal species: from *P. tessellata* Lyman that has flat arms and 4–5 brachial spines; from *P. lacertosa* Lyman that has only three spines but whose arms are very short and has only indentations instead of pores between the ventral brachial plates; from *P. arenosa* Lyman and *angulata* Lyman that have very numerous brachial spines.

PECTINURA HEROS LYMAN.

1879. — *Pectinura heros*, **Lyman (7)** p. 48; pl. XIV, fig. 389, 390 and 391.

1882. — *Pectinura heros*, **Lyman (8)** p. 16; pl. XXIII, fig 7, 8 and 9.

1897. — *Pectinura heros*, **Koehler (3)** p. 325.

Laccadive Islands, Long. E. 71° 35' 50". Lat. N. 12° 5' 35". Depth: 865–880 fathoms. A single specimen.

The diameter of the disc is only 9.5 millimeters. Although much smaller than the type described by Lyman, this specimen is absolutely identical to it.

P. heros was discovered by the “Challenger in the Banda Sea at a depth of 800 fathoms.

OPHIOCONIS INDICA KÖHLER.

(Pl. II, fig. 16 and 17).

1897. — *Ophioconis indica*, **Köehler (3)** p. 325; pl. VII. Fig. 38 and 39.

Andaman Islands. 8 miles to the west of Interview Island: 270–45 fathoms. A single specimen.

Diameter of the disc: 5 millimeters. The arms are broken at 3 centimeters from the disc.

The disc is pentagonal, the borders slightly concave. The dorsal surface is a little swollen. It is covered with fine, dense granules that completely hide the underlying plates as well as the radial shields. On the ventral surface, the interradial spaces are likewise covered with granules.

The buccal shields, completely bare, are large and triangular, with a sharp pointed corner, two round external corners and a round distal border. The oral and adoral plates, very elongated, are covered with granules, except the enlarged external part of the adoral plates. There are eight buccal papillae on each side. The three external ones are wide and large, nearly square. The others are elongated, conical and pointed. There is no unpaired terminal papilla on my specimen.

The first dorsal brachial plate is hidden in part by the granules. Its distal border is round. The following ones are very large, as wide as long at the base of the arms. They then become longer than wide. They are quadrangular. The proximal side is narrow. The lateral sides are divergent. The distal border is wide and convex. They cover nearly completely the dorsal surface of the arm and nearly all are contiguous

The first ventral brachial plate is wider than long, triangular, with round corners. The base of the triangle is the proximal side that is convex. The second is rectangular with round corners. The proximal side is narrower than the distal side. The following ones are pentagonal, longer than

wide, with a round proximal corner. The straight lateral sides are connected by round corners to the distal border that is convex. They are all contiguous.

The lateral plates are especially developed on the ventral side. They each have five spines at the base of the arm. Beyond the disc, this number generally falls to four. These spines are unequal. Their length is equal to half the article.

The tentacle pores have an elongated, oval scale. The first brachial article generally has two.

O. indica is distinguished from the few other species in the genus by its buccal shields and its five brachial spines.

The depth at which this species was captured cannot be evaluated with certainty. It is possible that it is sublittoral.

OPHIACTIS PERPLEXA KÖHLER. (Pl. VI; fig. 48 and 49),

1897.—*Ophiactis perplexa* Köhler (3) p. 327; pl. VII, fig. 40 and 41.

West of Cape Comorin. Long. E. 75° 4', Lat. N. 7° 5' 45". Depth: 719 fathoms. a single specimen.

Diameter of the disc: 5 millimeters; length of the arms: 32 millimeters.

The disc is sub-pentagonal. The dorsal surface is covered with very large plates, irregular and polygonal. The primary plates are large and arranged in a very distinct rosette, although a little irregular in the single specimen I have at my disposal. The radial shields are triangular, one and a half times longer than wide, contiguous on their external corner only and separated on the rest of their length by a single series of two plates. Their length is less than half the radius of the disc. They have on their free border one or two small spines.

The ventral surface is covered with small plates, regular and imbricated.

The periphery of the disc has some very strong spines that are seen especially on the ventral surface.

The buccal shields are small, lozenge-shaped, wider than long, with an obtuse proximal corner, round lateral corners and a round distal lobe. The adoral plates are small, in the form of a croissant, three times longer than wide. The oral plates are very small. There is on each side a single, very large buccal papilla, wide and obtuse, implanted on the adoral plate and covering the buccal tentacle pore. An unpaired papilla, wide, then at the end, surmounts the oral plates.

The dorsal brachial plates are large and triangular, two times wider than long. They have a more or less truncated proximal corner and a slightly round distal border. They are all contiguous.

The first ventral brachial plate is very small and triangular.

The following ones are large, as wide as long, pentagonal, with a truncated proximal corner, straight lateral sides and a straight or slightly convex distal boarder. The cease to be contiguous toward the tenth.

The protruding lateral plates have three unequal spines. Their length is near that of the article. The ventral spine is a little shorter and thicker than the two others. Its end is blunt.

The tentacle pores have a very large scale, round or lanceolate.

O. perplexa is very near *O. flexuosa*. It is distinguished from it by the presence of spines on the periphery of the disc, by the croissant-like form of its adoral plates, by the pentagonal ventral brachial plates, by the contiguous radial shields outside and by the presence of distinct primary plates in the middle of the dorsal surface of the disc.

OPHIACTIS LORIOLI K  HLER.
(Pl. VI; fig, 46 et 47.)

1897. — *Ophiactis Lorioli*, K  hler (3) p. 328; pl. VII, fig. 42 and 43.

1. Malabar coast. Long. E. 75° 16' 30'. Lat. N. 9° 53' 34". depth: 1091 fathoms. One specimen.
2. Laccadive Islands. Long. E. 71° 21'. Lat. N. 14° 22'. Depth: 1132 fathoms. One specimen,
3. Bay of Bengal. Long. E. 87° 59'. Lat. N. 17° 34'. Depth: 1300 fathoms. Three specimens.

Diameter of the disc: 7 millimeters: length of the arms: 35 millimeters.

The disc is thick, convex; the contour is round. The dorsal surface is covered with very large and very distinct plates. We see six large primary plates, pentagonal, forming a rosette at the center of the disc and outside it five smaller interrachial plates. The rest of the disc is filled with plates of a smaller size, polygonal and unequal. The radial shields are contiguous on two thirds of their length. They are separated on the other third by a triangular plate. Their internal border is strongly convex that makes their form nearly that of a semi-circle. Their width is one and a half times its length. This latter is less than a half-radius of the disc.

The ventral surface is covered with small plates, equal and imbricated.

The disc is totally lacking in spines.

The buccal shields are small. The principal part is triangular, as wide as long, with round corners. But the distal border has a very developed lobe that projects considerably into the interbrachial space and increases the length of the shield. The adoral plates are large and elongated. There are three buccal papillae on each side. The internal one is very large, swollen, rounded, connected to its congener. Its dimensions are nearly equal to that of the oral plate that ends it. The two external papillae are small, undeveloped and conical. In addition, we find below the buccal pore two large scales, round and wide, inserted on the adoral plate between the oral plate and the first ventral brachial plate.

The dorsal brachial plates are very large. The first is in the form of a semicircle. The next two or three have a narrow proximal border, a very wide and very convex distal border with round lateral sides. The others are biconvex. They are all contiguous.

The first ventral brachial plate is very large and quadrangular, with round corners. The following ones are a little longer than wide, with a straight proximal border, two concave lateral sides and a very convex distal border wider than the proximal side. The first ones are contiguous. Beyond the disc, they are separated from each other but by a very short interval.

The lateral plates are not very prominent, more developed on the ventral side than on the dorsal side. They have three conical spines, pointed, unequal, nearly the same length as the article. There are two scales with each tentacle pore. The external one is larger than the internal one.

I do not know an *Ophiactis* that is near *O. Lorioli*. The form of the radial shields separated for part of their length by a single triangular plate and contiguous for the rest, the arrangement of the

buccal papillae, and finally the presence of two tentacle scales separate it from all the species reported up until now.

AMPHIURA CAULLERYI K  HLER.
(Pl. VI; fig. 50 and 51.)

1897. — *Amphiura Caulleryi*, K  hler {3} p. 330; pl. VII, fig. 44 and 45.

1. Mouth of the Krishna. Depth: 753 fathoms. Four specimens of small size.
2. Off the coast of Colombo. Depth: 593 fathoms. One specimen.

Diameter of the disc of the specimen from Colombo: 6 millimeters; length of the arms: 45 millimeters.

The disc is flat, pentagonal, with a slightly concave contour in the interbrachial spaces. The dorsal surface has imbricated plates, larger in the central region than toward the periphery where they suddenly become smaller. A very clear line of demarcation separates the large plates from the small ones. We see in the center of the disc six round primary plates. The radials are separated from the centro-dorsal by a row of plates. The radial shields are elongated, two and a half times longer than wide, with a straight internal side and a convex external side. They are divergent and separated for their entire length by a series of three plates. The length is less than a half-radius of the disc.

The ventral surface is covered by very small, imbricated plates.

The buccal shields are a little longer than wide, lozenge-shaped. They have a proximal border limited by straight sides with round external corners and a distal side whose middle is raised into a very sharp ridge. The adoral plates are two times longer than wide, in the form of a thick croissant. But the internal border has a small protuberance toward its middle.

The oral plates are elongated and large, swollen toward the proximal end. They have a pair of very large buccal papillae, swollen, conical, connected to each other, nearly as large as the oral plates that they surmount. Outside and on the sides of the oral plates is a second papilla, smaller and flat. Finally, in the buccal corner, two other large and round papillae cover each side of the opening of the buccal tentacle pore.

The arms are very slender and very long. The dorsal brachial plates are much wider than long. The first is semi-circular. The following ones are biconvex. The first ones are usually contiguous. They are then separated by a narrow interval.

The first ventral brachial plate is triangular, with a convex distal border and an obtuse proximal border. The following ones are pentagonal. They have an obtuse proximal border, lateral sides concave for the tentacle pore and a very wide and round distal border. The first plates are contiguous. After the seventh or eighth, they are separated by a narrow interval.

The lateral plates are not prominent. They are especially developed on the ventral side. They have three large unequal spines having the length of the corresponding article, conical, very wide at the base and tapering rapidly toward the top that is pointed.

The tentacle pores have two small, round scales.

A. Caulleryi is near *A. incisa* Lyman. It differs by the presence, on the sides of the oral plates, of a buccal papilla that is not present in *A. incisa*, by the form of the dorsal brachial plates that is oval in this latter species, by the small size of the marginal scales of the disc and the little development of the tentacle scales, by the form of the adoral plates, etc.

A. Caulleryi also has affinities with the following species.

AMPHIURA FRIGIDA KÖHLER.
(Pl. XI, fig. 88; pl. XII, fig. 90.)

1897. — *Amphiura frigida*, **Köehler** (3) p. 332; pl. VIT, fig. 46 and 47.

Off the coast of Colombo. Long. E. 79° 37'. Lat. N. 6° 32'. Depth: 675 fathoms. Four specimens.

Diameter of the disc: 7 millimeters; length of the arms: 30 millimeters.

The disc is flat, sub-pentagonal, with a slightly concave contour in the interradial spaces. The central part of the disc is covered with very large imbricated plates. Among them we distinguish only a large, round centro-dorsal plate. In the interradial spaces is an irregular median row of four or five large plates. On each side of it are arranged two rows of smaller plates. The radial shields are large. They are triangular, one and a half times longer than wide. Their length is a little greater than a half-radius of the disc. They are near or even contiguous at their external corner. They are separated for the entire length by two successive plates.

The buccal shields are lozenge-shaped, much wider than long, with an obtuse proximal corner. They are limited by two straight sides, round lateral corners and a convex distal border with a round, more or less prominent lobe in the middle. The adoral plates are elongated, two times longer than wide, a little thicker outside than inside. The oral plates are tall, convergent, terminated in their proximal part by a round and protruding. Each is surmounted by a terminal papilla, large, conical and not contiguous with its congener. Laterally, there are two papillae that are wide at the base. The internal one is a little longer and more pointed than the external one that is round.

The dorsal brachial plates are large, wider than long and biconvex. The first two are smaller. In some specimens they are separated from the base of the arm. In others, they remain contiguous up to the fourth or fifth.

The first ventral brachial plate is small and triangular. The others are pentagonal, as wide as long, with an obtuse proximal corner, straight lateral sides and a round distal border connected to the lateral sides by round corners. They cease to be contiguous beyond the disc, but they always remain very close. The proximal corner usually becomes so obtuse that the plates take a square form.

The lateral plates are prominent with three spines. The lower and upper spines are as long as the article. The median one is a little larger. These spines are thin and tapered.

Each tentacle pore has two round or oval scales of moderate size.

A. frigida is near *A. incisa* Lyman and *Caulleryi* Kœhler. It is distinguished from the first species by the very large radial shields, by the arrangement of the dorsal plates of the disc, by the form of the buccal shields and by the nearly square ventral brachial plates.

It is distinguished from *A. Caulleryi* by the size of the radial shields, by the presence of large plates in the middle of the interradi al spaces and by the absence of very small plates toward the periphery of the disc of the dorsal surface, by the arrangement of the buccal papillae, by the form of the brachial spines that are long and tapered and not short and wide at the base as in *A. Caulleryi* and finally by the wider and longer buccal shields.

A. Caulleryi, *frigida* and *incisa* thus have, in spite of the differences that I raise, incontestable affinities.

AMPHIURA MISERA NOV. SP. (PL VIII; fig. 64 and 65).

Andaman Islands. Depth: 265 fathoms. A single specimen.

Diameter of the disc: 4 millimeters; length of the arms: 15 millimeters.

The contour of the disc is round. The dorsal surface is covered with very large plates, unequal and imbricated. We distinguish a round central plate larger than the other plates of the disc and five large primary radial plates separated from the preceding by a circle of much smaller plates, five radials and five interradi als. In the interradial spaces is a median row of four or five larger plates. On each side of it are two or three rows of smaller plates. The radial shields have a semi-circular form. They are contiguous nearly the entire length of the internal border. They are separated inside, for a quarter of their length, only by a very small triangular plate. They are two times longer than wide. Their length is less than a half-radius of the disc.

The ventral surface has very small regular and imbricated plates.

The buccal shields are lozenge-shaped, a little longer than wide, with a sharp proximal corner limited by two straight sides and two rounded external sides united by an equally round corner. The adoral plates are large and wide, three times longer than wide, very widened outside. The triangular oral plates are very small and low. There are on each side three buccal papillae. The rectangular external one is very wide and is without doubt the fusion of two papillae. The following one is small and square. The internal one is large, conical and wide.

The dorsal brachial plates are very large and triangular. They go far beyond the lateral plate. They have an obtuse proximal corner limited by two slightly convex sides and a slightly round distal side.

The first ventral brachial plate is very small and pentagonal. The following ones are very large and pentagonal, with a sharp proximal corner and straight sides. They are as long as wide and separated beyond the second.

The prominent lateral plates have three short enlarged spines, unequal and shorter than the article.

The tentacle pores have each two small equal scales.

A. misera is very near *A. squamata* Delle Chiaje and *tenuispina* Ljungmann. The arrangement of the plates of the disc and the presence of a central rosette of *A. misera* recalls *A. tenuispina*,

but the plates are more numerous than in the latter species. They are clearly distinguished by the wide short spines. It differs from *A. squamata* by the dorsal plates of the disc, larger, unequal, less numerous in the interradi al space and with a distinct central rosette.

AMPHIURA DISPAR K  HLER,
(Pl. X. fig. 81 and 82.)

1897. — *Amphiura dispar*, K  hler (3) p. 334; pl. VII, fig. 48 and 49.

- 1.—Bay of Bengal. Depth: 193 fathoms. Three specimens.
2. — Laccadive Islands. Long. E. 72° 43'. Lat. N. 15° 41'. Depth: 444 fathoms. One specimen.
3. — Pointe de Galles. Long. E. 79° 37'. Lat. N. 6° 32'. Depth: 675 fathoms. Five specimens.
4. Andaman Islands. Depth: 238–290 fathoms. One specimen.

Diameter of the disc: 6 millimeters; length of the arm: 35 millimeters.

The disc is very strongly concave in the interradi al spaces. The dorsal surface is flat and covered with imbricated plates among which is a central small round plate and five radi al plates separated from the preceding by two or three rows of plates. The plates are unequal in size. Those next to the radi al shields are larger than the others.

These are large, elongated and triangular, three times longer than wide, separated their entire length by a series of three plates. Their length is greater than a half-radius of the disc. The ventral surface is covered with very small and very dense plates.

The buccal plates are a little wider than long and triangular, with a round proximal corner, lateral corners equally round and a convex distal side having in its middle a small lobe. The adoral plates are irregularly triangular, very elongated, widened outside and strongly narrowed inside. The side adjacent to the buccal shield is more or less concave and follows the contour of the external corner of the shield. The oral plates are tall and directed obliquely. We see on each side three buccal papillae. The internal one is large, strong and elongated. It ends the oral plate and is separated from its congener. Outside is a conical, pointed papilla. Then is a third, ordinarily shorter, wide and more obtuse than the preceding to which it sometimes fused at the base. In addition, outside the buccal pore are two scales. One is very developed, remarkably elongated and spiniform. The other is short and obtuse.

The dorsal brachial plates are large, wider than long, biconvex and contiguous.

The first ventral brachial plate is small and irregularly quadrangular. The following ones are longer than wide, more of less clearly octagonal, with a truncated proximal corner, two slightly concave lateral sides and a widened distal border whose corners are likewise truncated. In some specimens, the corners are not very truncate or even round and the contour becomes hexagonal. All the plates are contiguous.

The lateral plates are very prominent. They have five thin and elongated spines. The ventral first one is longest and equal to two articles. The four others are a little shorter.

The tentacle pores have a very large, oval scale.

The form of the ventral brachial plates, the number and length of the brachial spines and the arrangement of the buccal papillae characterize sufficiently this species so that it is impossible to confuse it with any other of the genus.

AMPHIURA PARTITA KOEHLER.
(Pl. X; fig. 79 and 80)

1897. — *Amphiura partita*, **Kœhler** (3) p. 336 ; pl. VII, fig. 50 and 51.

1. — Laccadive Islands. Long. E. 72° 43'. Lat. N. 15° 41'. Depth: 444 fathoms. Five specimens.
2. — Pointe de Galles. Long. E. 79° 37'. Lat. N. 6° 32'. Depth: 675 fathoms. Two specimens.

The diameter of the disc is 8 millimeters in the largest specimen and 6 or 7 in the others; the length of the arms: 6 centimeters.

The disc is pentagonal, slightly concave in the interradial spaces. The dorsal surface is covered with very large irregular plates. Among them we see a round centro-dorsal plate. At some distance from it, are five radial plates whose size is hardly greater than that of the adjacent ones. The radial shields are small, with a straight internal border and a round external border. They are nearly semi-circular with round corners. These shields are slightly divergent and separated by a row of plates along their entire length.

The ventral surface has small, imbricated plates in the interradial spaces.

The buccal shields are lozenge-shaped, a little wider than long. The proximal corner is obtuse, the lateral sides are straight or slightly incurved and the distal side has a wide, prominent lobe in its center. The adoral plates are three times longer than wide. They are widened in the extreme region that bypasses the external corner of the radial shields. The oral plates are tall.

There are four buccal papillae on each side. The external one is not very developed. The two following ones are very large, tall and wide with a round border. The last is bilobed and often divided into two distinct papillae that would bring the total number to five.

The dorsal brachial plates are large, triangular and wider than long. Their distal border is nearly straight. They are contiguous or separated by a narrow interval.

The first ventral brachial plate is divided into two pairs by a slightly curved transverse groove. The distal part, smaller, is quadrangular. The proximal part is pentagonal. Most often the distal part is itself divided into two halves by a longitudinal groove. I believe this arrangement is normal because I see it especially in the largest specimens. The following plates are pentagonal, wider than long, with a slightly raised proximal corner and a barely curved distal border. The following ones are separated by a narrow space.

The lateral plates are prominent. They have three spines longer than the article, conical, wide at the base and a blunt end.

The tentacle pores each have two scales. The external one is very large and elongated. The internal one is smaller.

A. partita is especially near *A. duplicata* with which we can confuse it. However, the form of the buccal shields, which is very constant in all my specimens, is very different from that which Lyman indicated and represented. The radial shields are shorter and more rounded in *A. partita*. Finally, the ventral brachial plates do not have the same form. The number of brachial spines cannot be used. The number varies from three to four in *A. duplicata*.

OPHIOCHITON AMBULATOR KÖHLER.
(Pl. VI; fig. 44 and 45).

1897. — *Ophiochiton ambulator*, **Köehler** (3) p. 337; pl. VII; fig. 52 and 53.

1. — Trincomale. Depth: 200–350 fathoms. One specimen of large size and two small ones.
2. — Godavery delta. Depth: 270 fathoms. Two specimens.
3. — Laccadive Islands. Long. E. 72° 38' 10". Lat. N. 15° 5' 3". Depth: 696 fathoms. Two specimens.
4. — Maldives Islands. Long. E. 75° 4'. Lat. N. 7° 5' 45". Depth: 719 fathoms. One specimen.
5. — Malabar coast. Long. E. 75° 36' 30". Lat. N. 9° 34' 57". Depth: 405 fathoms. One specimen.
6. — Belouchistan (Mekran) coast. Long. E. 65° 28' 10". Lat. N. 7° 5' 45". Depth: 890 fathoms. One specimen.

Diameter of the disc of the largest specimen: 23 millimeters; length of the arms: 250 millimeters; width of the arms at the base: 3.5 millimeters.

The disc is thick, pentagonal, more or less deeply notched in the interradi al spaces. The dorsal surface has numerous dense and imbricated plates, very small in the central region, a little larger toward the periphery and near the radial shields. We see a round central plate and, separated from it by several rows of plates, five round radial plates and even larger than it. In addition, we generally see five other radial plates located at the points of the radial shields and, at the same height, five interradi al plates. All these plates are round and of the same size. The radial shields are large, triangular, one and a half times longer than wide, a little shorter than a half-radius of the disc. They are greatly divergent, separated inside by several rows of plates and outside by a single plate, larger and triangular. Outside this latter are two or three widened and low plates that precede the dorsal brachial plates.

The ventral surface has small imbricated plates that are larger near the buccal shield and genital slits. These are wider than long.

The buccal shields are two times wider than long, in the form of a flattened triangle. The lateral corners are wide and round. The distal border has in its middle a small more or less apparent lobe. The lateral sides are slightly concave. The adoral plates are three times longer than wide, small in the inner part, widened in the external region that goes around the external corner of the buccal shield. The oral plates are triangular, very elevated. There are six buccal papillae on each side. The three external ones are wide and obtuse. The three others are conical and pointed. The terminal unpaired papilla is a little larger.

The arms are remarkably long and reach twelve or fourteen times the diameter of the disc. They have on the ventral median line an extremely projecting keel that runs their entire length. The dorsal surface is swollen.

The two first dorsal brachial plates are low, much wider than long. The following ones are trapezoidal. The proximal side is narrow and concave, the distal side wide and convex, the two lateral sides are straight. They are all contiguous. These plates have the form of a tulle or a dihedral corner. Their edge forms a crest that goes the entire length of the arm.

The first ventral brachial plate is small, wider than long and round. The following ones are lozenge-shaped, wider than long and contiguous. Their distal corner is raised into a protuberance that corresponds to the ventral median crest reported above.

The lateral plates, not very protruding, have three unequal spines whose length is nearly equal to that of two articles.

The tentacle pores each has two scales inserted on their proximal border. The external one is very large and round. The internal one is small. On the first pair of pores, the scales are equal.

O. ambulator is remarkable for its robust form, its large size and the length of its arms. It is especially near *O. fastigatus* Lyman which it approaches by the arrangement of the plates of the disc that are however larger toward the periphery than in *O. ambulator* and by the keel that the arms have in the middle of their ventral surface. It is distinguished by the greater projection of the dorsal brachial plates, by the presence of three brachial spines instead of four and by the tentacle scales inserted on the same border and not opposite each other.

O. lentus Lyman has three spines and the tentacle scales are arranged as in *O. ambulator*, but the disc is covered with plates uniformly larger and the radial shields are much smaller. The dorsal plates are triangular and the arms barely keeled.

O. tenuispinus Lyman likewise has three spines. It has only one tentacle scale and the buccal shields are longer than wide.

O. Lymani Studer has four brachial spines and only one tentacle scale. The ventral brachial plates are small and semi-circular.

O. grandis Verrill has also only one tentacle scale. It appears to approach *O. ambulator*. Unfortunately Verrill gives only a very brief description of his species and no figure, which makes any comparison impossible.

OPHIOCHITON MODESTUS KÖHLER. (Pl. IX, fig. 74. Pl. X, fig. 77 and 78)

1897. *Ophiichiton modestus*, **Köhler** (3) p. 340; pl. VII, fig. 54 and 55.

Andaman Islands. Depth: 265 fathoms. A single specimen.

Diameter of the disk: 3 millimeters; length of the arms: 25 millimeters.

The disc is flat, sub-pentagonal. The dorsal surface has imbricated scales, a little swollen, unequal and small. We distinguish in the center a centro-dorsal plate, large and round, and five smaller primary radial plates, separated from the central plate by two rows of plates. Outside each radial plate is a second of the same size, oval and separated from each other by a smaller plate. At the periphery, there is a border of larger plates. Finally, in the middle of each interradial space, we recognize likewise an irregular row of plates wider than the adjacent ones. The radial shields

are extremely small, over, two times longer than wide, hardly wider than the plates of the disc. They are widely separated from each other by plates larger than the others.

The ventral surface is covered by small, regular, imbricated plates. The genital slit is wide.

The buccal shields are as long as wide and triangular, with round external corners and a convex distal border. The adoral plates are large, irregularly triangular, narrowed in their internal part, very wide to the contrary in the external region. The side adjacent to the buccal shield follows the contour of the external corner of the shield. The oral plates are small and low.

There are four buccal papillae on each side. They are wide and obtuse and form a regular row. There is no terminal papilla larger than the others.

The first two or three dorsal brachial plates are small and very widened. The following ones are very large and rectangular, with a straight proximal side, slightly divergent lateral sides connected by the round corners to the distal side that is round. They are a little wider than long. They are contiguous and, even at the base of the arm, a little imbricated.

The first ventral brachial plate is small and triangular, with a truncated corner. The following ones are very large and triangular, with a proximal corner, slightly indented for the tentacle pores, and a convex distal border. They are contiguous at first, then separate toward the seventh or eighth.

The lateral plates are very large and flat. Their straight distal border has three very wide, contiguous spines that fill all the side of the arms. These spines have a round end. Their length is less than that of the article.

The tentacle pores have a very large, round scale.

My specimen is probably not an adult. But the characters it has are sufficiently clear for it to be impossible to relate it to any known species. It is very near *O. tenuispinus* Lyman, but it is distinguished by six papillae that are conical in form, by the dimensions of the brachial spines that are thin and whose upper one reaches the length of two articles in *O. tenuispinus*. The radial shields are very much smaller and comparatively more spaced in *O. modestus* than in *O. tenuispinus*. Finally, the dorsal brachial plates have a completely different form than in the two species.

OPHIACANTHA PENTAGONA K  HLER. (Pl. IV; fig. 27, 28 and 29)

1897. *Ophiacantha pentagona*, **K  hler (3)** p. 342; pl. VIII, fig. 56 and 57.

1. — Andaman Islands (Cinque Island). Depth: 120 fathoms. One specimen.
2. — Andaman Islands. (South Sentinel Island.) Depth: 240 fathoms. Several specimens.
3. — Andaman Islands. (North Sentinel Island.) Depth: 250 fathoms. Four specimens.
4. — Andaman Islands. Depth: 265 fathoms. One specimen.
5. — Cape Bluff. Depth: 375 fathoms. One specimen.

Diameter of the disc: 5 millimeters; length of the arms: 25 millimeters.

The disc is flat, pentagonal, more or less deeply indented in the interradial spaces. The dorsal surface is uniformly covered with elongated and very slender spines, ended by three or four very thin and long spinules. The spines become shorter and less numerous toward the base of the arm,

leaving bare the distal region of the radial shields whose continuation is indicated by the projecting sides. The ventral surface has thin, imbricated scales that appear between the spines. These are shorter and more spaced than on the dorsal surface.

The buccal shields are large and triangular, with a sharp and very pronounced proximal corner that is embedded more or less between the adoral plates in the form of a wedge. The lateral sides are a little concave and the distal side is convex. It has in its middle a small lobe whose development varies greatly with specimen and sometimes is lacking. The adoral plates are large and wide, in the form of a croissant, three times longer than wide. The oral plates are small and triangular. There are three buccal papillae on each side, elongated, conical and strong. The external one is sometimes enlarged with a round border. In addition, an unpaired papilla, remarkably large and long, ends the jaws.

The arms are moniliform due to the form of the lateral brachial plates that are very projecting.

The dorsal brachial plates are small and triangular, with a sharp proximal corner but not elongated and a strongly convex distal corner. They are widely separated from each other from the first.

The first ventral brachial plate is triangular or semi-circular, sometimes clearly trilobed. The second is large and triangular, with a convex distal border. The following ones are pentagonal, with an obtuse proximal corner, two short lateral sides sometimes a little indented from the tentacle pores, and a slightly concave distal border. The first plates are wider than long. They then become as long as wide. They are all separated.

The lateral plates have considerable ridge in their first distal half. They are very developed and cover an extended part of the dorsal and ventral surfaces of the arms. They have five or six spines, round at the end. The first ventral spine is a little longer than the article. The penultimate dorsal is equal to two articles. The last dorsal spine has the same length, but sometimes it is shorter than the preceding. The ventral spines have denticulations more or less pronounced depending on the specimen. The others are nearly smooth.

The tentacle pores each have a small scale, spiniform, short, conical with fine denticulations.

O. pentagona has some variations relating especially to the number of brachial spines and the development of the teeth of these spines, as well as the size of the last dorsal spine.

O. pentagona has affinities with *O. stellata* Lyman, *Dallasii* Duncan and *indica* Ljungmann. It is distinguished from *O. stellata* by the smaller number of brachial spines (always less than 7), by the shorter tentacle scale, by the dorsal spines likewise shorter and by a different form of the dorsal and ventral plates.

O. Dallasii has only four very short brachial spines and very small buccal shields.

Finally, *O. indica* has nine brachial spines and four buccal papillae.

OPHIACANTHA VESTITA K  HLER. (Pl. III; fig. 18, 19 and 20)

1897. — *Ophiacantha vestita*, K  hler (3) p. 344; pl. VIII, fig. 58 and 59.

1. Coast of Coromandel. Long. E. 80° 22'. Lat. N. 13° 41' 27". Depth; 195–210 fathoms. One specimen.
- 2, Andaman Islands. (North Sentinel Island). Depth: 250 fathoms. Two specimens.

Diameter of the disc of the largest specimen: 10 millimeters; width of the arms at the base: 2.5 millimeters; the length of the arms is more than 55 millimeters.

The contour of the disc is round. The dorsal surface is uniformly covered with very thin and long spines, dense, smooth with a blunt end, sometimes flat and even widened into a spatula.

On the ventral surface in the interbrachial spaces, the spines appear only toward the periphery. All the surface is covered with small imbricated scales, larger toward the border of the genital slits that are very wide.

The buccal shields are wide and trilobed. They have a principal triangular part with a very open proximal corner and two round lateral coroners. But the distal border has in its middle a remarkably prominent lobe that makes a considerable projection in the interbrachial space. The adoral plates are rather narrow, three times longer than wide and a little curved. The oral plates are large, very tall, two and a half times longer than wide. There are on each side five or six buccal papillae, thin, tapering and pointed. An unpaired papilla ends the jaws. Inside are two wide scales that cover the opening of the buccal pore.

The arms appear to be long relative to the diameter of the disc. The dorsal brachial plates are small and triangular, with a proximal corner and a convex distal side. They are separated. Nearly all have on their distal border one or two elongated, very fine spines similar to those of the disc, but more delicate.

The first ventral brachial plate is small and triangular, flat and much wider than long. The following ones are pentagonal, as wide as long, with a very obtuse proximal corner, two straight lateral sides and a slightly concave distal border.

The very prominent lateral brachial plates have six spines. The first ventral one has a length equal to one and a half articles. The last dorsal one is equal to three articles. The spines have a round end. They have extremely fine spines, very dense, arranged in parallel, very short. All have the same length.

The tentacle pores have an extremely large lanceolate scale whose length is nearly that of the corresponding article.

The specimens generally have a pale gray color. The dorsal surface of the arms has here and there very regular patches of pale brown.

This species is very near *O. hirsuta* Lyman by the armature of the disc and the aspect of the brachial spines. It differs from it by its single very large tentacle scale, by the radial shields with a prominent distal lobe and by the form of the brachial plates.

By the aspect of the disc covered with long spines, *O. vestita* recalls also *O. echinulata* Lyman. But it differs by the very shape of these spines, by the number of brachial spines, by the form of the buccal pieces, etc.

By the size of the tentacle scale and by the form of the disc, *O. vestita* is also near *O. abyssicola* G. O. Sars. It is distinguished from it by the regular arrangement of its buccal papillae and by the number of brachial spines. In addition, in *O. abyssicola*, the first pairs of tentacle pores have two or three scales that are not found in *O. vestita*.

It is necessary also to relate *O. vestita* to *O. gratiosa* that I shall describe later because of the form of the dorsal and ventral plates, the development of the tentacle scale and the height of the oral plates. But the armature of the disc, the form of the buccal shields and the number of brachial spines clearly separates the two species.

OPHIACANTHA GRATIOSA K  HLER.
(Pl VIII, fig. 68; Pl. IX, fig. 71 and 72)

1897. — *Ophiacantha gratiosa*, K  hler (3) p. 346; pl. VIII, fig 60 and 61.

1. — Bay of Bengal. Depth: 193 fathoms. Three specimens.
2. — Andaman Islands. South Sentinel Island. Depth: 240 fathoms. One specimen.
3. — Laccadive Islands. Long. E. 72' 43'. Lat. N. 15' 41'. Depth: 444 fathoms. Numerous specimens.

Diameter of the disc of the largest specimens: 14 millimeters; length of the arm: 10 centimeters.

The disc is flat and pentagonal and, in general, greatly concave in the interradial spaces. The dorsal surface is covered with short, round granules in the central region. But they elongate toward the periphery and become short, conical spines. These granules are not dense. The radial shields are entirely visible. They are small and triangular, contiguous by their external corner and strongly divergent. Around each of them, we see some imbricated plates that are not hidden by the granules.

The ventral surface has the same very short, conical spines as the periphery of the disc.

The buccal shields are triangular, wider than long. The lateral corners are round. The distal border has in its middle a more or less projecting round lobe. The adoral plates are very elongated, narrowed inside, widened outside. Their external part goes around the round corner of the buccal shield. The oral plates are tall, two and a half times longer than wide. There are generally seven buccal papillae on each side. The five internal ones are elongated and conical. The two external ones are wide and round. They cover the opening of the buccal tentacle pore. The terminal unpaired papilla is not much larger than the adjacent ones.

The dorsal brachial plates are small and triangular, with a slightly convex distal side. They are separated from each other at the base of the arms. The small spines of the disc are continuous on the first brachial plate that is completely covered.

All, or nearly all, of the following plates have on their distal border some small spines whose number varies from two to five. We even find sometimes one or two similar spines on their free surface.

The first ventral brachial plate is small, very wide and oval. The following ones are pentagonal, with an obtuse proximal corner, two straight lateral sides connected by the round corners to the distal side that is nearly straight. These plates are especially small, as wide as long. They are separated from the first.

The lateral very prominent plates have eight smooth spines, thin and very long. The first ventral one has the length of two articles. The last dorsal one, four or five.

The tentacle pores are covered with a very large scale, elongated and lanceolate, as long as the ventral plate. The pores of the first two pairs often have two scales.

O. gratiosa is near *O. abnormis* that it approaches by its smooth, thin spines and by the presence of small spines on the free border of the dorsal brachial plates. But it is easily distinguished from it by the form of the buccal shields and especially by the adoral plates as well as by the number and the length of the brachial spines. I note on this subject that there is a

contradiction between the description and the figures of Lyman regarding these spines. This author says, in fact, that the two upper ones have a length equal to two articles and that the first ventral one has only half the length of the articles. In his figures, these are much longer but much shorter however in *O. gratiosa*.

OPHIACANTHA SOCIABILIS Kœhler.
(Pl. X, fig. 75 and 76; pl. XI, fig. 89)

1897. — *Ophiacantha sociabilis*, Kœhler (3) p. 348; pl. VIII, fig. 62 and 63.

1. — Bay of Bengal. Long. E. 85°86'. Lat. N. 12°20'. depth: 1,803 fathoms. Several specimens.
2. — Andaman Islands. Long. E. 91°16'. Lat. N. 11°15'. Depth: 1,840 fathoms. Several specimens

Diameter of the disc in the largest specimens: 16 millimeters; length of arms: 9 centimeters; with of arms at the base: 4 millimeters.

The disc is sub-pentagonal. In some specimens, it is very slightly concave in the interbrachial spaces. It is covered with short, conical spines, with a rugose surface. It usually ends in a bouquet of two or three very short spinules that appear especially on the spines of the periphery of the disc. The radial shields are completely hidden. Their external part is sometimes apparent. The ventral surface, in the interbrachial spaces, is covered with spines similar to those of the dorsal surface, but generally shorter, wider at the base, less dense and blunt. Those near the periphery have only a bouquet of spinules.

The genital slit is wide and elongated.

The buccal shields are large, lozenge-shaped or triangular, wider than long, with a blunt proximal corner and two widely round lateral corners. The convex distal border usually has in its middle a more or less prominent lobe. When this lobe is missing, the shield has a triangular form. The adoral plates are elongated, three times longer than wide. The widened external part follows the external corner of the buccal shield. The oral plates are triangular and low. There are four buccal papillae on each side. The external one is short and not very apparent. The other three are large, elongated and conical. The terminal unpaired papilla is a little larger than the others. It is sometimes replaced by two papillae identical to its neighbors.

The spines of the disc are continuous with the dorsal surface of the arm in the form of granules that cover the first two dorsal brachial plates. These are very enlarged. The following are large, triangular or even bell-shaped, with a semi-circular proximal border and a more or less convex distal border.

The first ventral brachial plate is small and pentagonal. The two or three following ones are large and triangular, with a very open proximal corner, narrow lateral sides and a convex distal border, often with a lobe in its middle. Beyond the disc, the proximal corner becomes more open and tends to disappear. The distal border becomes semi-circular and the plates become longer than wide. They are separated from each other after the second plate.

The prominent ventral lateral plates have seven spines whose length increases from the first ventral plate, which is a little longer than the article to the last whose length is equal to two articles.

The first two ventral plates are round at the end and usually smooth. The others are pointed and have fine, spaced projections.

The single tentacle scale is small and spiniform.

O. sociabilis is very near *O. discoidea* Lyman that it recalls by the number of brachial spines, by the tentacle scale and by the form of the dorsal brachial plates. It is clearly distinguished from it by the characters of the buccal pieces and notably by the form of the buccal shields and the adoral plates.

OPHIACANTHA COMPOSITA K  HLER. (Pl. VIII, fig. 66; pl. IX, fig. 72 and 73)

1897. — *Ophiacantha composita*, K  hler (3) p. 350; pl. VIII, fig. 64 and 65.

Nicobar Islands. Long. E. 91° 5'. Lat N. 5° 56'. Depth: 1,590 fathoms. A single specimen

Diameter of the disc: 11 millimeters; the arms are broken near the base.

The arm is round, sub-pentagonal. The dorsal surface is uniformly covered with fine, very dense spines that end in a crown of seven to eight delicate, short spinules. All these spines form a very remarkably regular group. The radial shields are completely hidden.

The ventral surface is covered, in the interbrachial spaces, with spines similar to those of the dorsal surface and just as dense.

The buccal shields are small, triangular and a little wider than long. The adoral plates are thick, two times wider than long and with parallel borders. The oral plates are triangular and fairly low. There are three buccal papillae on each side. The two internal papillae are elongated, conical and narrow. The external papilla is very wide and, according to its form, appears formed by the fusion of a conical and tall papilla with another wide and low papilla. Is this form constant in the species? This is something I cannot know because I have only one specimen. There is a larger terminal papilla.

The dorsal brachial plates are small and triangular, with a sharp proximal corner and a convex distal border. They are separated from the base of the arms. Their dimensions increase after the fifth or sixth plate.

The first ventral brachial plate is pentagonal. The following ones are triangular, wider than long, with an obtuse proximal corner and a slightly convex distal side. Then they become as wide as long. They are separated from each from the second plate.

The large, prominent lateral plates have seven spines with sharp denticulations. They are numerous on the proximal half of the spine and become very rare or completely disappear near the end. The first ventral spine is longer than the article. The last dorsal plate has the length of two articles.

The tentacle pores are covered by a small scale, thin and spiniform.

The enlarged form of the external buccal papilla recalls *O. levispina* that *O. composita* approaches also by its disc with spines that end in a crown of fine spinules and by its spiniform

tentacle scales. But it distinguished from it by most of the other characters and notably by the spines with spinules.

OPHIACANTHA DUPLEX KÖHLER.
(Pl. VIII, fig. 67; pl. IX, fig. 69 and 70)

1897. — *Ophiacantha duplex*, Köhler (3) p. 352; pl. VIII, fig. 66 and 67.

Colombo. Long. E. 79° 37'. Lat. N. 6° 32'. Depth: 675 fathoms. One specimen.

Diameter of the disc: 10 millimeters; arms broken near the disc.

The disc is indented on each side at the base of the arms. It is prominent to the contrary in the interradial spaces. The dorsal surface is covered with two kinds of spines. Some are thin, short cylinders with a crown of four to five spinules at the end. They are uniformly distributed on the surface of the disc. The others, much less numerous, are elongated, wide at the base and tapering gradually. They are spiny. They are distributed irregularly in the central region of the disc. The radial shields are partly visible as well as the adjacent plates that are bare.

The ventral surface of the disc, in the interbrachial spaces, is covered with very fine scales, small and imbricated. Toward the periphery appear some granules that are elongated, with spinules. They are continuous with the cylindrical spines of the dorsal surface.

The buccal shields are lozenge-shaped, a little wider than long, with an obtuse proximal corner, slightly curved lateral sides, united by two round corners to the distal side that has a very prominent lobe in its middle. The adoral plates are rather thick, a little curved, two and a half times longer than wide. The oral plates are elongated and tall. Each has on each side three buccal papillae, long, thin, conical with a blunt tip and a very large unpaired terminal papilla.

The brachial dorsal plates are small and triangular, as long as wide, with a proximal corner and a convex distal side. They are separated from the base of the arms.

The first ventral brachial plate is large, quadrangular, a little wider than long. The following ones are pentagonal, with an obtuse proximal corner, two short and slightly concave lateral sides and a convex distal side with round corners. The first two or three are contiguous; the others are separated.

The very prominent lateral plates have eight spines with fairly strong denticulations. The first ventral one is longer than the article. The last dorsal one is longer than two articles.

The tentacle scale is fairly large, conical and thin.

O. duplex has some affinities with *O. imago*. It differs, in addition to the armature of the disc, by its spiny spines and by the number of buccal papillae. It is equally rather close to *O. longidens* as well as *O. vorax* that I am going to describe. But it is distinguished from them, first of all, by the armature of the disc, then by the number of brachial spines and by the form of the dorsal and ventral brachial plates.

OPHIACANTHA VORAX KÖHLER.
(Pl. VII; fig 52, 53 and 54)

1897. — *Ophiacantha vorax*, Köhler (3) p. 352; pl. VIII, fig. 68 and 69.

Cape Comorin. Long. E, 76° 34'. Lat. N. 7° 04'. Depth: 1,043 brasses. A single specimen.

Diameter of the disc: 5 millimeters; length of the arms: 40 millimeters.

The disk is round, sub-pentagonal. The dorsal surface is completely covered with cylindrical spines, thin, with an enlarged base, of moderate length, and ending in five or six fairly strong spinules. The radial shields, very small, are visible and are bare as well as some adjacent plates. The ventral surface has, in the interbrachial spaces, the same spines as the dorsal surface. But they are less dense. We see the imbricated plates that support them.

The buccal shields, wider than long, have the form of a lozenge with round corners, except the proximal corner. The proximal sides are a little concave and the distal sides are convex. The adoral plates are curved, three times longer than wide. The oral plates are elongated. The three buccal papillae on each side are very strong, long and conical with a blunt point. They resemble those of *O. longidens*. The terminal unpaired papilla is very large, thick and wide with a round end.

The dorsal brachial plates are of moderate size, rather a little large, triangular, swollen, with a proximal corner and a slightly convex distal side. They are separated from the base by a fairly narrow interval.

The first ventral brachial plate is fairly large, triangular or trilobed. The second one is pentagonal, wider than long, with an obtuse proximal corner with concave sides and a convex distal border. The following ones become as wide as, then further, wider than long. They are nearly quadrangular.

The very prominent lateral plates have eight spines at the base of the arms. This number then falls to six. The spines are thin, elongated, with very fine and dense denticulations. The first ventral spine has the length of an article and a half. The last dorsal spine has the length of three articles.

The tentacle pores are covered by a remarkably large, lanceolate, pointed scale, whose length equals that of the ventral brachial plate.

O. vorax has great resemblances with *O. longidens* Lyman. I have even hesitated at first to separate it from it. An attentive comparison however permits me to raise some differences that oppose making them the same. This comparison is especially easy to make because *O. longidens* was established by Lyman according to a specimen whose disc was 4 millimeters in diameter, i.e., nearly the size of my specimens of *O. vorax*.

The form of the buccal papillae and the buccal shields, as well as the armature of the disc, are identical in the two species. But the number and the arrangement of the brachial spines, the form of the brachial plates and the tentacle scales differ. *O. vorax* has only six brachial spines and not

seven. These spines are thinner and more elongated than in *O. longidens*. The denticulations are finer and even most of the spine appears smooth. Their denticulations are visible only with the microscope.

To judge from the figure of Lyman, the dorsal brachial plates have a more open proximal corner and the distal border much more convex than in my species. The ventral plates are wider than long and nearly semi-circular instead of being quadrangular. The oral plates are lower in *O. longidens*, while they are tall and prominent in *O. vorax*. Finally, Lyman mentions in the first species a spiniform tentacle scale, but unfortunately without indicating its size. Moreover, he has omitted representing it in his figure. There is thus some doubt on the exact form of this scale. But, in any case, the term spiniform that he employs cannot be applied to the lanceolate and very large scale of *O. vorax*.

O. vorax also approaches *O. duplex* Kœhler. It is distinguished at first glance of the single specimen that has served me to establish the species by the armature of the disc. Independent of this difference, I note that the dorsal brachial plates are larger, the brachial spines thinner and longer and less spiny, and the tentacle scale larger in *O. vorax* than in *O. duplex*.

But, in spite of these differences, it is no less certain that the three species *O. longidens*, *O. vorax* and *duplex* are very close to one another.

OPHIOMITRA INTEGRA KœHLER. (Pl. V, fig. 36 and 37; pl. VII, fig. 60.)

1897. — *Ophiomitra integra*, Kœhler (3), p. 356; pl. IX, fig. 76 and 77.

Andaman Islands. Between the North and South Sentinel Islands. Depth; 220–240 fathoms. A single specimen.

Diameter of the disc: 11 millimeters; arms broken at 35 millimeters from the disc.

The disc is round. The slightly swollen dorsal surface is covered with imbricated plates; Those of the central region are smaller than the other and are bare, as well as those that separate the radial shields. Each of the other plates has a cylindrical spine, short and ending in a crown of small spinules. We note them especially toward the periphery of the disc where the spines are taller. They shorten as they approach the center of the disc. The radial shields are very large, round or oval, hardly longer than wide. The interbrachial spaces of the ventral surface are covered by imbricated plates that have short spines toward the periphery.

The buccal shields are wider than long, lozenge-shaped, with a very obtuse proximal corner, limited by two slightly concave sides and convex distal sides meeting at a blunt corner that forms a small slightly projecting lobe. The adoral plates are wide, with slightly curved parallel borders, two times longer than wide. The oral plates are large and tall. There are six buccal papillae on each side. The two external ones that cover the opening of the buccal tentacle pore are wide and lower than the following ones that are elongated, fine and pointed. The unpaired terminal papilla is scarcely larger than the adjacent ones.

The first dorsal brachial plates, small, low and quadrangular, are in angle of the first two lateral plates. The others are triangular, fairly large, with a sharp proximal corner and a convex distal border. They are separated from each other.

The first ventral brachial plate is very small and oval. The following ones are pentagonal, with an open proximal corner, slightly concave and short lateral sides and a round distal border, sometimes slightly concave in its middle. They are nearly as long as wide and are separated from each other by a narrow interval.

The lateral plates are very prominent and developed, especially on the dorsal side. They have eight smooth spines, fairly thin, tapered and with a blunt end. The first ventral plate is equal to the article. The last dorsal plate is longer than three articles.

The first two pairs of tentacle pores have two oval scales. The following pores have only one. These scales are of average size.

O. integra is distinguished easily from all known species of the genus. It has some affinities with *O. valida* Lyman from which it differs by the round disc, by the number and form of buccal papillae, by the form of the ventral brachial plates, etc.

OPHIOMITRA RUDIS KÖHLER. (Pl. VII; fig. 58 and 59).

1897. — *Ophiomitra rudis*, Köhler (3), p. 358; pl. IX, fig. 74 and 75.

1. — Laccadive Islands. Long. E. 72° 40' 20 ", Lat. N. 10° 47' 50". Depth: 705 fathoms. Five specimens.
2. — Maldiv Islands. Long. E. 75° 4'. Lat. N. 7° 5' 45'. Depth: 719 fathoms. Four specimens.
3. — Andaman Islands. Depth: 780 fathoms. One specimen.

Diameter of the disc: 14 millimeters; length of the arms: 80 millimeters; width of the arms at the base: 3 millimeters.

The disc is slightly depressed in the central region. It has five deep cuts at its periphery that penetrate into the interrarial spaces. The dorsal surface is covered with thin, imbricated plates, small in the central region and in the cuts themselves. In contrast, from each side of the cuts, the plates are elongated diagonally while becoming much larger. They are arranged regularly following one after each other in a series in which the size of the plates increases as they approach the border of the disc as in *O. incisa* Lyman. We find a half dozen large plates on each side of the interrarial cuts. The plates of the central region have elongated and strong spines, with sharp asperities. Their length reaches two millimeters. The radial shields are large and triangular, two times longer than wide. the rise on their distal border into a slight prominence. They are divergent and separated their entire length first by one row and then by several rows of plates.

The interbrachial spaces of the ventral surface is covered with small imbricated plates that lack spines.

The buccal shields are as wide as long, lozenge-shaped, with a sharp proximal corner limited by two straight sides with round and projecting lateral corners, a very convex distal border with a prominent lobe. The adoral plates are quadrangular, two and half times longer than wide, with a slightly concave proximal border. The oral plates are small and triangular, slightly elevated. There are four buccal papillae on each side. The two external ones are short and round. The two internal ones are long and sharp. The unpaired terminal papilla is larger.

The dorsal brachial plates are large, nearly semi-circular, with a strongly convex proximal border and a nearly straight distal border. They are wider than long. They cease being contiguous toward the second or third plate while remaining very close. Toward the middle of the arms, they become as long as wide and nearly bell-shaped.

The first ventral brachial plate is small and triangular, contiguous to the second that is triangular. Beyond, the plates are separated and become triangular, wider than long, with a very slightly curved distal border and a very obtuse proximal corner.

The very prominent lateral plates have five strongly echinulated spines. the first ventral spine is a littler larger than the article and last dorsal one is equal to three articles.

The tentacle pores have a conical scale, blunt, of small size.

O. rudis has affinities with *O. incisa*, *chelys* and *dipsacos* described by Lyman. We distinguish these species by the following characters:

O. incisa has contiguous radial shields for the greater part of their length and the first tentacle pores have several scales.

O. chelys has very narrow radial shields, pointed at the proximal end. The dorsal plates of the disc are less numerous in the central part, having tuberosities or very short obtuse spines that are found equally on the first large plates limiting the radial cut and on those that separate the radial shields. The dorsal brachial plates are separated at the base of the arms. The form of these plates separates further *O. chelys* from *O. rudis*.

O. dipsacos has, like *O. incisa*, radial shields contiguous for most of their length. The plates that border the interradiial cuts are extremely developed. The buccal shields have a very sharp and elongated corner. The central plates have three short spines ending in spinules. Finally, the brachial spines are longer than in *O. rudis*.

OPHIOCAMAX FASCICULATA LYMAN.

1883. — *Ophiocamax fasciculata*, **Lyman (9)** p. 265; pl. VII, fig. 92, 93 and 94,

1897. — *Ophiocamax fasciculata*, **Kœhler (3)** p. 360.

Andaman Islands. 13 miles to the S. W. of North Sentinel Island. Several specimens.

In the largest specimens, the diameter of the disc is 15 millimeters and the length of the arms is 130 millimeters. These large specimens do not perfectly conform to the description and figures of Lyman. I even see some variations between them. Only one specimen whose disc diameter is 9 millimeters in diameter is near to the type of Lyman. In the large individuals, I note that the number of brachial spines varies from seven to eight and most usually there are two small spines (instead of only one) inside the large dorsal spine. The buccal shields are smaller than in the figure of Lyman, but the size of these shields varies from one specimen to another. The radial cuts are deeper and the radial shields are a little more elongated than in the type of Lyman. Finally, the dorsal brachial plates have fine granules and the tentacle papillae are echinulate. The form of the spines that cover the dorsal surface of the disc varies greatly. In some specimens, they are simply conical protuberances, nearly smooth. In others, they are elongated spines, wide and strongly echinulae.

Under these conditions, I can only refer my specimens to *O. fasciculata* and noting this ophiuroid as susceptible to vary in very wide limits.

OPHIOTHRIX ARISTULATA LYMAN var. INVESTIGATORIS.
(Pl. XI; fig 86 and 87).

1897. — *Ophiothrix aristulata* var. *Investigatoris*, **Kœhler** (3), p. 361; pl. IX, fig. 72 and 73.

1. — Coast of Coromandel. Long. E, 80° 29' 37". Lat. N. 13° 45' 38". Depth: 210 fathoms. Three specimens.
2. — Andaman Islands. Long. E. 92° 46' 40". Lat. N. 11° 31' 40". Depth; 188–220 fathoms. Two specimens.
3. — Andaman Islands. East of North and South Sentinel Islands. Depth; 240–220 fathoms. Several specimens.
4. — Andaman Islands. 13 miles S. W. of North Sentinel Island. Depth: 130–250 fathoms. Several specimens.
5. — Andaman Islands. South Sentinel Island. depth: 240 fathoms. Two small specimens.
6. — Andaman Islands. Depth: 238–290 fathoms. Three specimens.
7. — Andaman Islands. Depth: 265 fathoms. One very small specimen.

Diameter of the disc: 18 millimeters; length of the arms: 15 to 16 centimeters; width of the arms at the base: 4 millimeters.

The disc is thick, flat on the dorsal surface. The interradi al spaces have a more or less considerable projection in the interval of the arms. The largest part of the dorsal surface of the disc is filled by the radial shields. These are very large and triangular. The internal peripheral corner is projecting. They are contiguous at their proximal and distal ends. The adjacent sides are extremely indented. It results in the formation of a narrow space that has elongated spines. The same spines occur in the formation of a narrow space that has elongated spines. The same spines occur in the central part, that is not covered by the radial shields and in the interradi al spaces. All these spines are very long and thin, with sharp and prominent denticulations, but spaced and articulated on a distinct and projecting mamelon. The radial shields are about two times longer than wide. Their width is equal to five-sixths of the radius of the disc.

The interbrachial surfaces of the ventral surface are covered with spines smaller than on the dorsal surface.

The genital plate is very developed and forms a consider projection on each side of the arm.

The buccal shields are small, lozenge-shaped, wider than long, with a sharp proximal corner, two later sides slightly concave and a round distal border with a more or less prominent lobe in its middle. The dorsal plates are small, two times wider than long, in the form of a croissant, wider outside than inside. They do not touch the first ventral brachial plate. The oral plates are larger and very wide at the base. The buccal papillae are numerous. We find first a peripheral row of large papillae and inside four or five rows of finer and very dense papillae.

The dorsal brachial plates are of medium size, as wide as long and contiguous. They have the form of a lozenge with equal sides whose distal corner is round and the proximate corner slightly ... The median part of each plate is prominent, especially in the distal half. It results in a kind projecting crest that extends the length of the arm.

The size of the ventral brachial plates increases regularly from the first to the sixteenth, after which the size remains constant. The first is quadrangular, wider than long. The second is pentagonal. The following ones are hexagonal, with a convex proximal border (often breaking into a median side and two oblique sides that gives the plates an octagonal form, two slightly concave lateral sides, a slightly concave dorsal side connected to two lateral sides by two oblique sides.

The lateral plates are very prominent. They have ten spines. The first ventral spine is very small. Then the length increases regularly from the second, that is equal to one and a half articles to the last dorsal whose length reaches five articles. These spines have numerous projecting asperities.

The tentacle pores have a short, small and pointed scale.

The specimens of *Ophiothrix* collected by the "Investigator" differ from the type described and figured by Lyman by a more robust aspect and by the notably more developed radial shields that cover a larger part of the dorsal surface of the disc. The spines on the dorsal surface are also stronger and longer. Finally, the brachial spines are much larger than in the type of Lyman. These differences are constant, and I appreciated them all the more readily as I was able to compare the specimens of the "Investigator" with the very types of the "Challenger" that were given to me by Jeffrey Bell. I have thus believed it necessary to consider them as a variety of the species established by Lyman.

OPHIOMYXA BENGALENSIS KÆHLER. (Pl. XII; fig. 91 and 92.)

1897. —*Ophiomyxa hengalensis*, **Kæhler** (3) p. 363; pl. IX, fig. 70 and 71.

1. — Andaman Islands. Depth: 173 fathoms. Four specimens.

2. — Andaman Islands. North Sentinel Island. Depth: 250 fathoms. Four specimens.

Diameter of the largest specimen: 16 millimeters; length of the arms: 11 centimeters.

The disc is pentagonal, more or less strongly indented in the interradial spaces. The dorsal surface of the disc is covered with a thick integument, having round granules in the central region of the disc and around the radial shields. These are flattened and disappear toward the periphery where the integument is nearly smooth. The radial shields are very apparent and make a strong projection of the integument. They form two elongated sides, narrow in the middle. Their length is equal to a third of the radius of the disc. There is no trace of plates at the periphery of the disc.

The buccal plates are very large and triangular, with a more or less apparent distal lobe. Their length, including the lobe, is equal to their width. The proximal corner is pointed. The lateral corners are round. The dorsal plates are narrow, elongated, four times longer than wide. The oral plates are small and narrow. There are four buccal papillae on each side and sometimes five in the large specimens. They are small, conical with a blunt point. The unpaired terminal papilla is larger than the others.

The dorsal surface of the arms is covered by a granular integument that follows that of the disc. The ventral plates are very little developed and hardly visible. We recognize them after treatment with potash in the form of very small scales strongly indented on their aboral border and nearly completely divided into two halves. They are widely separated by the lateral plates. These are not joined completely on the ventral median line, which has a very marked depression separating each lateral plate from its congener. There are three brachial spines. They are a little

shorter than the article, strongly enlarged and ending in a blunt point, slightly echinulate at the end.

The tentacle pores are large and round.

The general color of the specimens is pale brown.

O. bengalensis is distinguished from most species of the genus by the complete absence of marginal plates on the disc. By the number of brachial spines it approaches *O. serpentaria* Lyman and *vivipara* Studer. The first of these species has a disc lacking marginal scales, but it has only three buccal papillae on each side. The radial shields are very reduced and the ventral brachial plates are fused. *O. vivipara* is distinguished from *O. bengalensis* by the presence of plates on the dorsal surface of the disc.

OPHIOCREAS sp.

1897. — *Ophiocreas* sp. **K  hler** (3) p. 365.

Andaman Islands. Long. E. 90°52'. Lat. N, 12°50'. Depth: 1,644 fathoms. A single specimen.

The specimen is doubtlessly incompletely developed. Moreover, it is in a very bad state. It seems to me nevertheless to belong to a new species.

The diameter of the disc is 4.5 millimeters. The arms have a length of 32 millimeters. The disc is lenticular. The dorsal surface is regularly convex. The radial shields appear clearly under the integument, but they do not make a projection.

The buccal shields are small and round. The adoral plates are two times longer than wide. The oral plates are tall. A single small unpaired papilla ends the jaws.

As in *O. abyssicola* Lyman, the first pair of pores lacks a tentacle papilla. The pores of the second pair has only one and each of the follow pairs has two. The most internal reaches the length of the article. The end of the papillae is blunt and has some very fine spinules.

The presence of these two scales at the base of the arms and the absence of lateral buccal papillae does not permit referring this *Ophiocreas* to a known species and I believe it is new.

GORGONOCEPHALUS LEVIGATUS K  HLER.

(Pl. XII, fig. 97; pl. XIV, fig, 99)

1897. — *Gorgonocephalus levigatus*, **K  hler** (3) p. 365; pl. IX, fig. 78 and 79.

1. — Trincomale. Long. E. 81°7'45'. Lat. N. 8°40'10", Depth: 200–350 fathoms. One specimen in very good condition.

2.— Colombo. Depth: 142—400 fathoms. One specimen in bad condition.

	Specimen A millimeters	Specimen B millimeters
Diameter of the disc between the end of one radial side to the middle of the opposite interradial space.	47	33
Distance between the end of one radial side and the end of the opposite side.	58	38
Length of the radial sides.	28	22
Width of the arms at the base (inside the disc).	10	8
Distance between the base of the buccal corner and the first corner of bifurcation.	20	20
Width of the arm after the first branching (branching of the second order).	6	5
Distance between the first bifurcation and the second (branching of the second order).	16	16
Distance between the second and the third bifurcation.	22	21
Distance between the third and fourth bifurcation.	23	36
Distance between the fourth and fifth bifurcation.	27	26
Distance between the fifth and sixth bifurcation.	35	35
Distance between the sixth and seventh bifurcation.	34	4
Distance between the seventh and eighth bifurcation.	32	—

The disc is profoundly indented in the interradial spaces. The dorsal surface is covered with a thin integument, transparent, soft and perfectly smooth, having neither spines nor granules of any kind and lacking any calcareous deposit. The radial ribs are clearly seen by transparency below the integument that remains smooth. We easily recognize on the surface of these ribs, round stripes corresponding to the lines of separation of successive calcareous deposits. These ribs are very long and thin relative to their length. They are a little thicker in the proximal half than in the distal part. The peripheral end of each rib is enlarged and flat. It forms a semi-circle that articulates with the end of the corresponding genital plate that also forms a semi-circle.

The interbranchial spaces of the disc are covered, like the dorsal surface, with a thin, smooth integument. The genital slits are very elongated. Their length reaches 15 millimeters. They also are very wide.

I have not been able to distinguish the madreporite.

The dental papillae and the teeth have the same form. They cannot be distinguished from each other. They are elongated, spiniform, arranged very near each other in several vertical series. The buccal papillae are also spiniform, but smaller than preceding. Separated from them, they form a small irregular group of three or four papillae on each side.

The arms are very wide at the base. The ventral surface is concave, especially at the first branchings. The dorsal surface is very convex. A longitudinal groove extends its entire length. It even remains visible on branching of the sixth order. The successive articles are separated by wide intervals with undulating contours. We distinguish on each article a very regular double row of round granules that are contiguous but not very prominent. These granules together form a band that is as wide as the space the separates two adjacent bands.

The ventral surface of the arms is completely smooth. The three or four first pore pairs lack papillae. The two or three following pairs have only one. They the following pairs have two. We usually find three on the articles that follow the second bifurcation. These papillae are elongated,

cylindrical with a blunt end. The points that end the central calcareous network appears only after treatment with potash.

G. levigatus is characterized especially by the strongly indented interradial spaces, by the development of the genital slits and by the complete absence of all ornamentation on the dorsal surface of the disc. By the last character it approaches a variety of *G. eucnemis* described by Danielssen and Koren under the name of *G. Malmgreni* whose disc is nearly smooth. But it is separated from it by all the other characters that I just indicated.

GORGONOCEPHALUS CORNUTUS KÖHLER.

(Pl. XII, fig. 95 and 96; pl. XIII, fig. 98)

1897. — *Gorgonocephalus cornutus*, **Köehler** (3) p. 368; pl. IX, fig. 80 and 81.

Andaman Islands. 8 miles to the west of Interview Island. Depth: 270–45 fathoms. One specimen,

(The considerable difference between the extreme depths of dredging of this species does not permit us to know with certainty if it comes from deep water or the sublittoral zone.)

Diameter of the disc (distance between the end of a radial side and the bottom of the opposite interradial indentation.	17 millimeters
Distance between the ends of two opposite radial ribs.	20 —
Length of the radial ribs.	9 —
Width of the arms inside the disc.	5 —
Distance between the bottom of the buccal corner and the first bifurcation. ...	11.5 —
Distance between the first and second bifurcation.	10 —
Distance between the second and third bifurcation.	12 —
Distance between the third and fourth bifurcation.	12 —
Distance between the fourth and fifth bifurcation.	11 —

The disc is profoundly indented in the interradial spaces. The dorsal surface, depressed in the center, is covered with a thick integument with fine, conical granules, usually ended in a short, bare and pointed spinule, especially toward the periphery of the disc. We find in addition in the interradial spaces some conical protuberances much larger than the adjacent granules and ended in three or four fine projecting spiniules. The protuberances are not numerous and are irregularly distributed. At the center of the disc, we see a group of five similar protuberances.

The radial ribs are projecting, wide, close to each other, contiguous inside and very slightly divergent. Their surface has the same granules as the rest of the disc. But, in addition, each has toward their distal end, a large conical protuberance, wide at the base with a blunt point and completely characteristic.

The ventral interradial spaces of the disc are covered by a smooth integument. The genital slits are wide and pear-shaped. It has been impossible for me to distinguish the madreporite.

The buccal and dental papillae are numerous, close to each other and arranged in two or three series. They are fine and conical ...74....

The dorsal surface of the arms is strongly complex. The ventral surface is flat.

The integument of the dorsal surface has granules that, on the two or three first articles, resemble those of the disc. I.e., they end in a spinule. But in the rest of the arm, they are smooth

and low. In addition, we see, on the branches of the first and second order principally, projecting conical protuberances, less developed than those of the disc but having the same characters as the latter.

The tentacle pores have no trace of scales. In contrast, the lateral surfaces of the arms have from the second or third article after the disc, a vertical group of three or four small papillae, true spines that are short and conical and end in a small pointed spinule. On the branches of the first and second order, there are four sometimes even five spines. On the following branches, the number falls to three and even two. The insertion of these papillae is at the union of the ventral and lateral surfaces of the arm.

To judge from the inequality of the size of the conical protuberances of the disc and the arms, it seems to me that the single specimen of *G. cornutus* collected by the "Investigator" still has not attained its full development. It is thus probable that in the adult, the protuberances that, in my specimen, are scarcely indicated on the dorsal surface of the disc and the arms, should be numerous and important projections.

The presence of a large protuberance at the end of the radial ribs, to the exclusion of any other developed project on these ribs, and the existence of papillae on the lateral surfaces of the arms joined to the absence of tentacle papillae justifies the creation of a new species for the *Gorgonocephalus* that I cannot refer to any other known species.

ASTRONYX LOVENI MÜLLER AND TROSCHEL.

1842. — *Astronyx Loveni*, Müller and Troschel (10). p. 119.

The diameter of the disc does not exceed 14 millimeters in the largest specimens.

The genital openings are larger than usual, and the internal brachial papillae begin to elongate only at a fairly great distance from the disc. The other characters conform to those of *A. Loveni*.

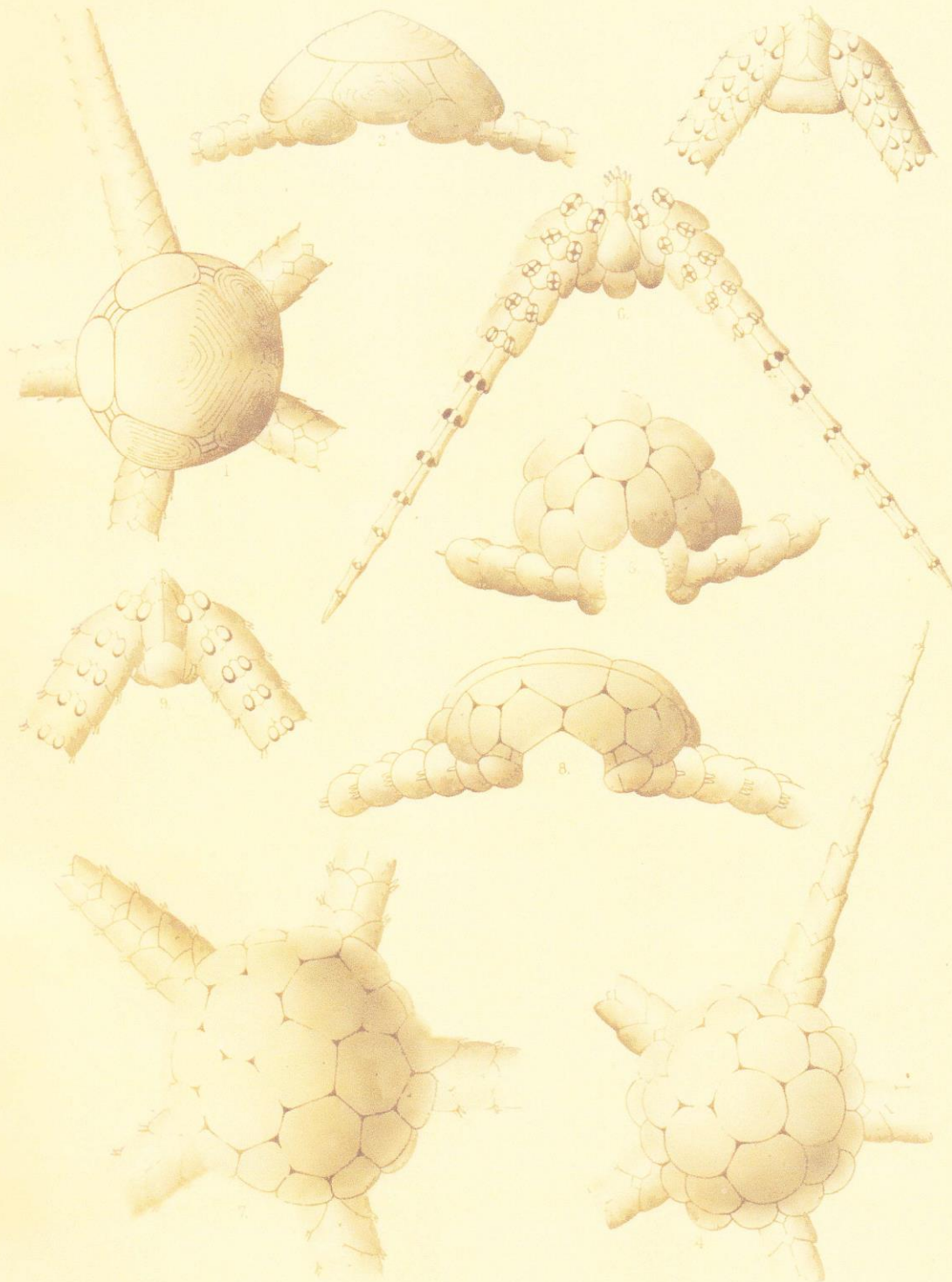
We know that this species, known especially from the coasts of Norway, has been encountered by the "Challenger" in the seas of Japan at a depth of 350 fathoms. Its presence in the Indian Ocean is thus not surprising.

INDEX BIBLIOGRAPHIQUE.

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- (11.) — **Studer, Th.** Übersicht über die Ophiuriden welche während der Reise S. M. S. " Gazelle" um der Erde 1874–76 gesammelt wurden. *Ahhandlungen der Königl. Akademie der Wissenschaften zu Berlin*. 1882.

PLATE I.

- Fig. 1. — *Ophiotypa simplex* Kœhler, dorsal surface. Mag. = 10.
Fig. 2. — *Ophiotypa simplex*, lateral view. Mag. = 10.
Fig. 3. — *Ophiotypa simplex*, ventral surface. Mag. = 10.
Fig. 4. — *Ophiopyrgus Alcoki* Kœhler, dorsal surface. Mag. = 8.
Fig. 5. — *Ophiopyrgus Alcocki*, lateral view. Mag. = 8.
Fig. 6. — *Ophiopyrgus Alcocki*, ventral surface. Mag. = 8.
Fig. 7. — *Ophiomastus tumidus* Kœhler, dorsal surface. Mag. = 9.
Fig. 8. — *Ophiomastus tumidus*, lateral view. Mag. = 9.
Fig. 9. — *Ophioniastus tumidus*, ventral surface. Mag. = 9.

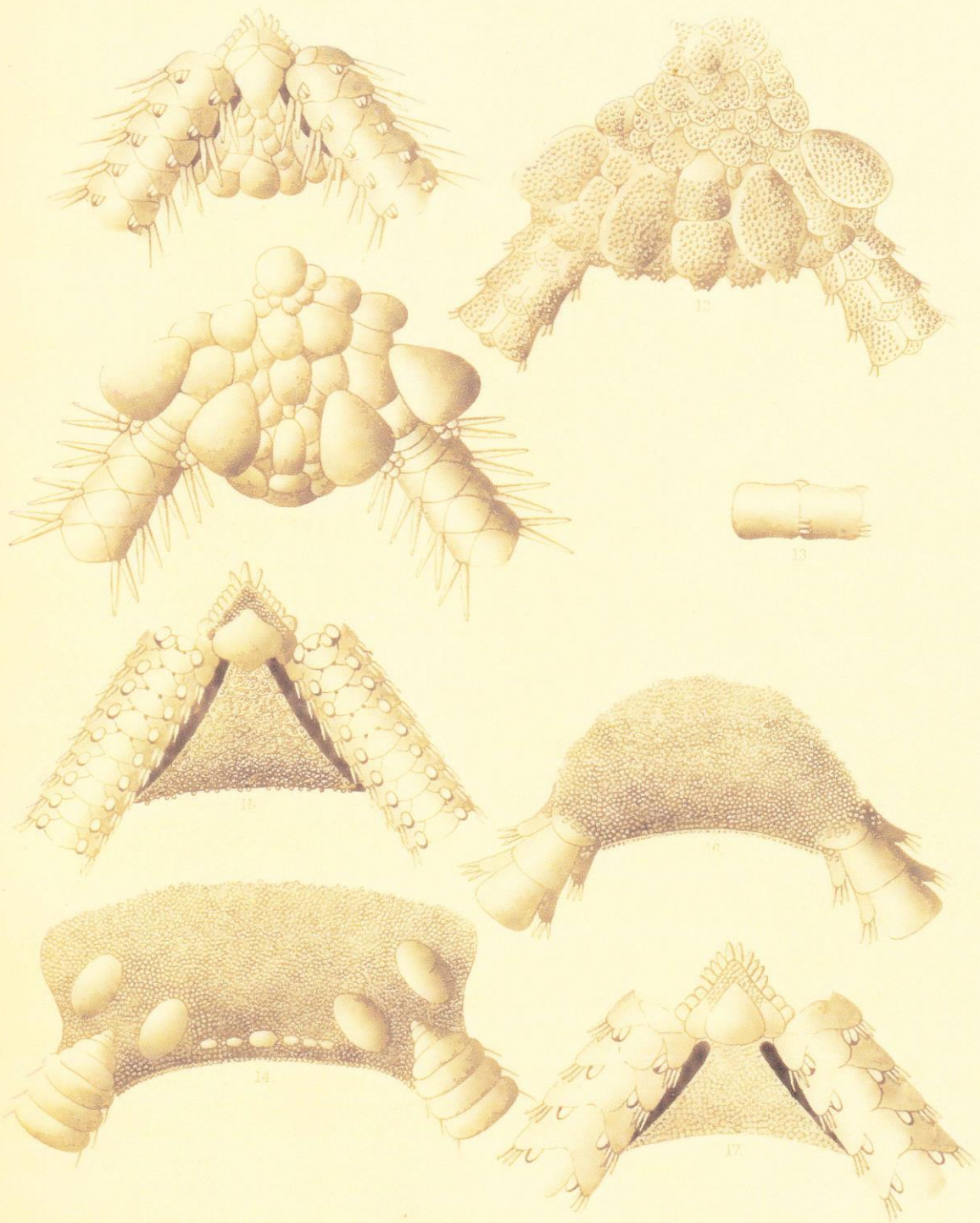


1, 2, 3. *Ophiopyra simplex* Koehler. 4, 5, 6. *Ophiopyrus Alcocki* Koehler.

7, 8, 9. *Ophiomastus tumidus* Koehler.

PLATE II.

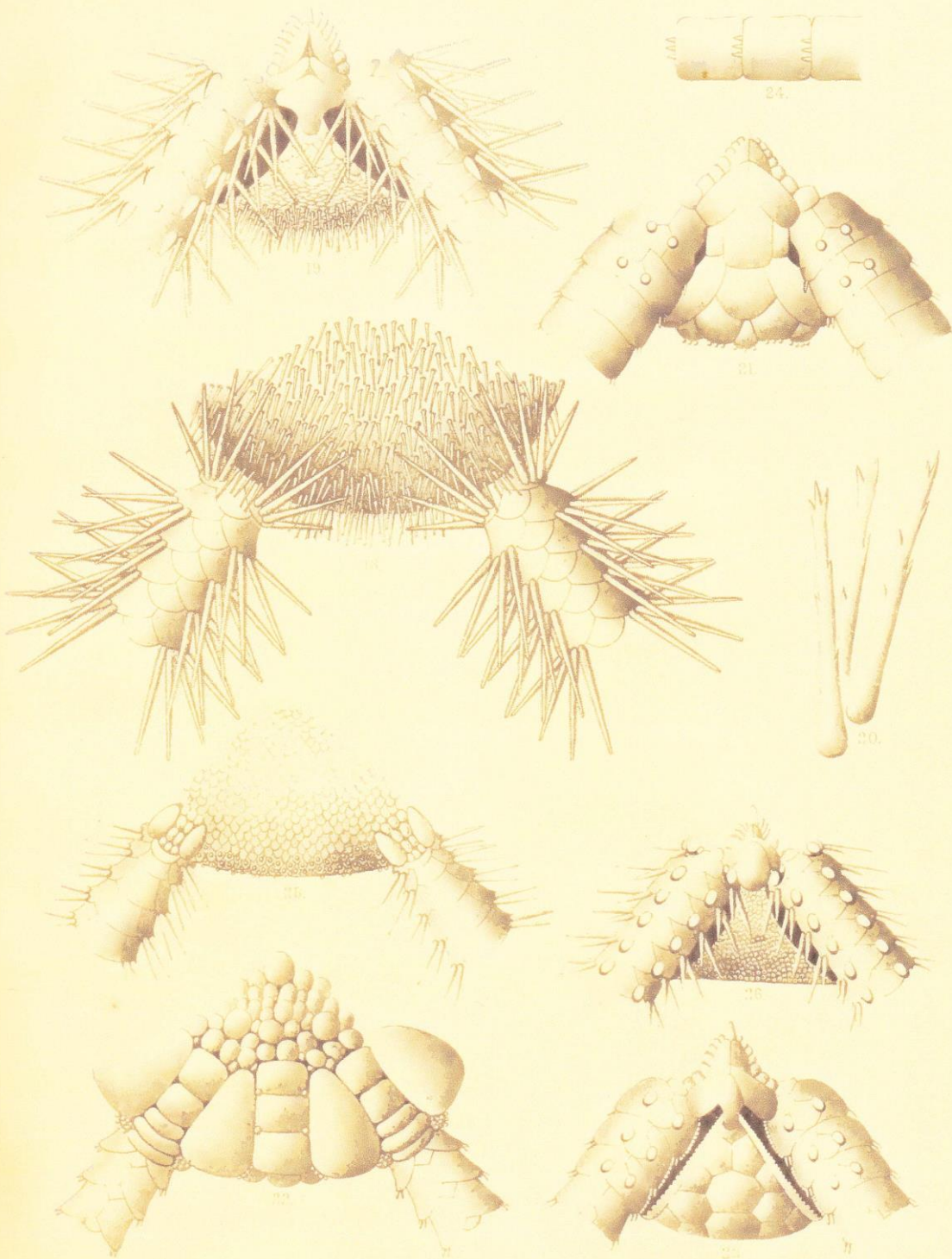
- Fig. 10. — *Ophiozona hispinosa* Kœhler, dorsal surface. Mag. = 6.5.
Fig. 11. — *Ophiozona hispinosa*, ventral surface. Mag.=6.5.
Fig. 12. — *Ophiomusium scalare* Lyman, dorsal surface. Mag. = 6.
Fig. 13. — *Ophiomusium scalare*, lateral view of the arm. Mag. = 6.
Fig. 14. — *Pectinura conspicua* Kœhler, dorsal surface. Mag. = 2.5.
Fig. 15. — *Pectinura conspicua*, ventral surface. Mag. = 2.5.
Fig. 16. — *Ophioconis indica* Kœhler, dorsal surface. Mag. = 9.
Fig. 17. — *Ophioconis indica*, ventral surface. Mag = 9.



10, 11. *Ophiozona bispinosa* Koehler. 12, 13. *Ophiomusium scalare* Lyman.
14, 15. *Pectinura conspicua* Koehler. 16, 17. *Ophioconus indica* Koehler.

PLATE III.

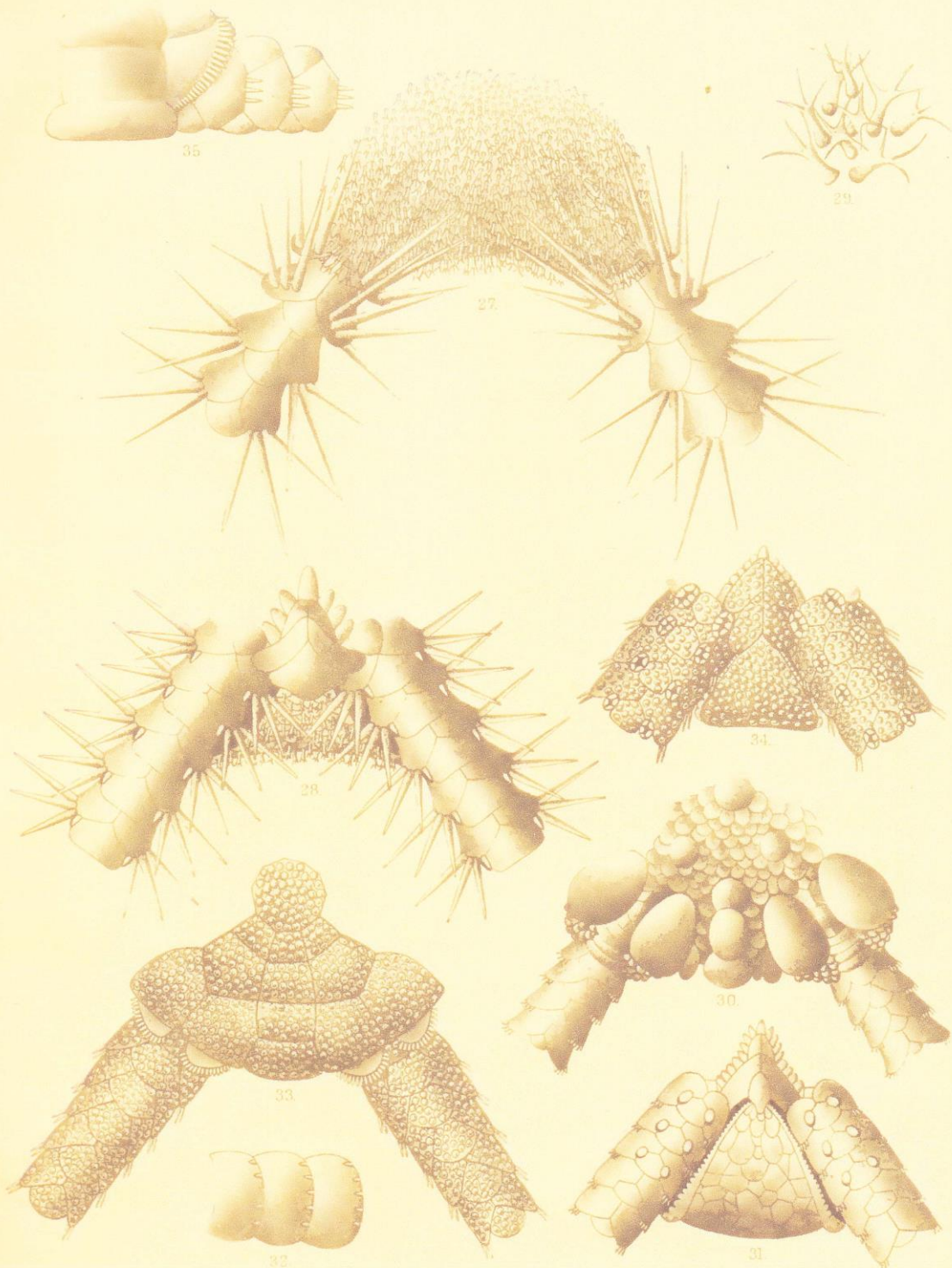
- Fig. 18. — *Ophiacantha vestita* Kœhler, dorsal surface. Mag. = 7.
Fig. 19. — *Ophiacantha vestita*, ventral. Mag. = 7.
Fig. 20. — *Ophiacantha vestita*, spines of the disc. Mag. = 10.
Fig. 21. — *Ophiomusium scalare* Kœhler, ventral surface. Mag. = 6.
Fig. 22. — *Ophiomusium elegans* Kœhler, dorsal surface. Mag. = 9.
Fig. 23. — *Ophiomusium elegans*, ventral surface. Mag. = 9.
Fig. 24. — *Ophiomusium elegans*, lateral surface of an arm. Mag. = 9.
Fig. 25. — *Ophiopeza custos* Kœhler, dorsal surface. Mag. = 9.
Fig. 26. — *Ophiopeza custos*, ventral surface. Mag.= 9.



18, 19, 20. *Ophiacantha vestita* Koehler. 21. *Ophiomusium scalare* Koehler.
22, 23, 24. *Ophiomusium elegans* Koehler. 25, 26. *Ophiopeza cristata* Koehler.

PLATE IV.

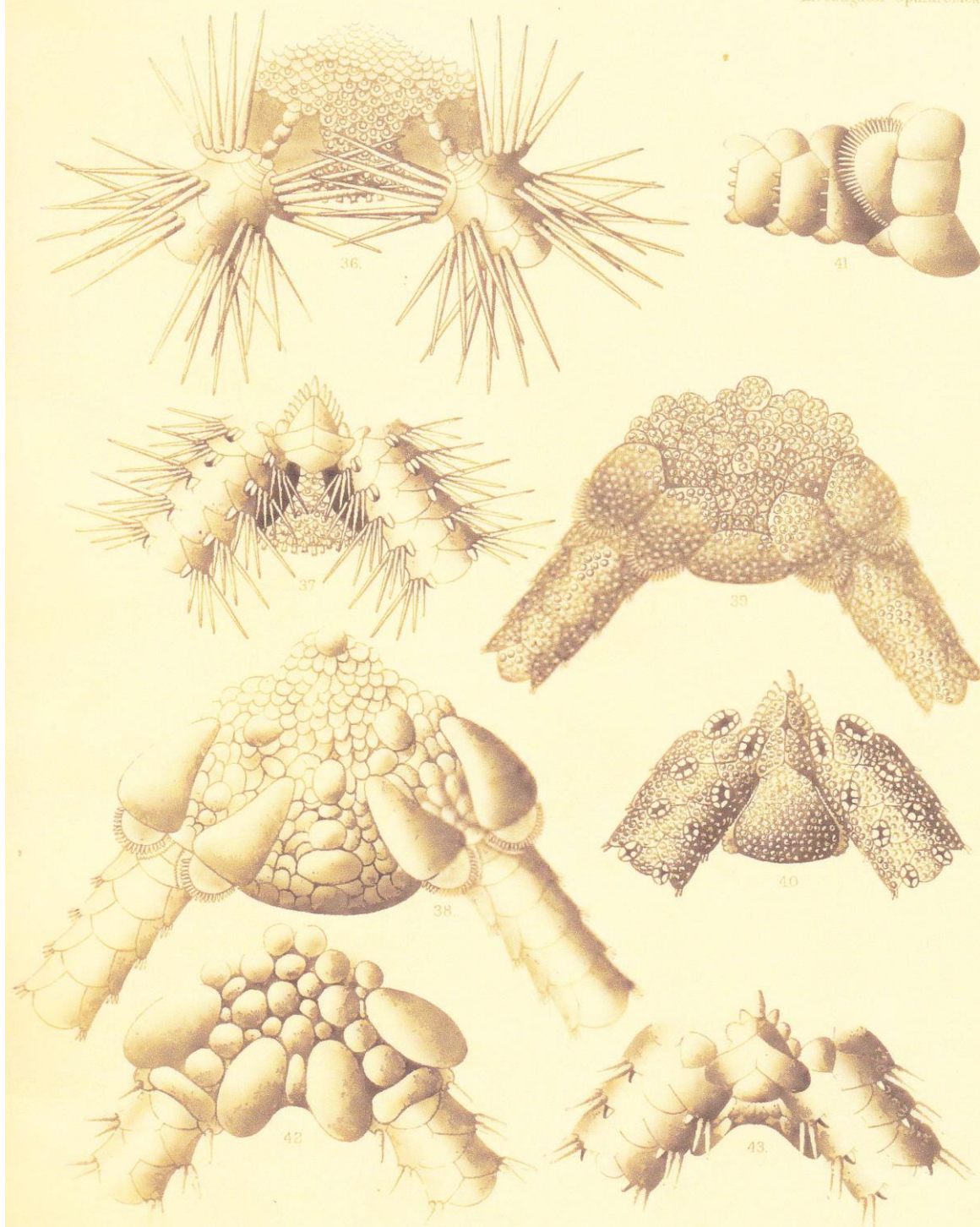
- Fig. 27. — *Ophiacantha pentagona* Kœhler, dorsal surface. Mag. = 15.
Fig. 28. — *Ophiacantha pentagona*, ventral surface. Mag. = 15.
Fig. 29. — *Ophiacantha pentagona*, spines of the disc. Mag. = 50.
Fig. 30. — *Ophiomusium familiare* Kœhler, dorsal surface. Mag. = 5.
Fig. 31. — *Ophiomusium familiare*, ventral surface. Mag. = 5.
Fig. 32. — *Ophiomusium familiare*, lateral surface of an arm. Mag. = 10.
Fig. 33. — *Ophioglypha paupera* Kœhler, dorsal surface. Mag.= 11.
Fig. 34. — *Ophioglypha paupera* Kœhler, ventral surface. Mag. = 11.
Fig. 35. — *Ophioglypha paupera*, lateral view. Mag. = 15.



27, 28, 29, *Ophiacantha pentagona* Koehler. 30, 31, 32, *Ophiomusium familiare* Koehler.
33, 34, 35, *Ophioglypha paupera* Koehler.

PLATE V.

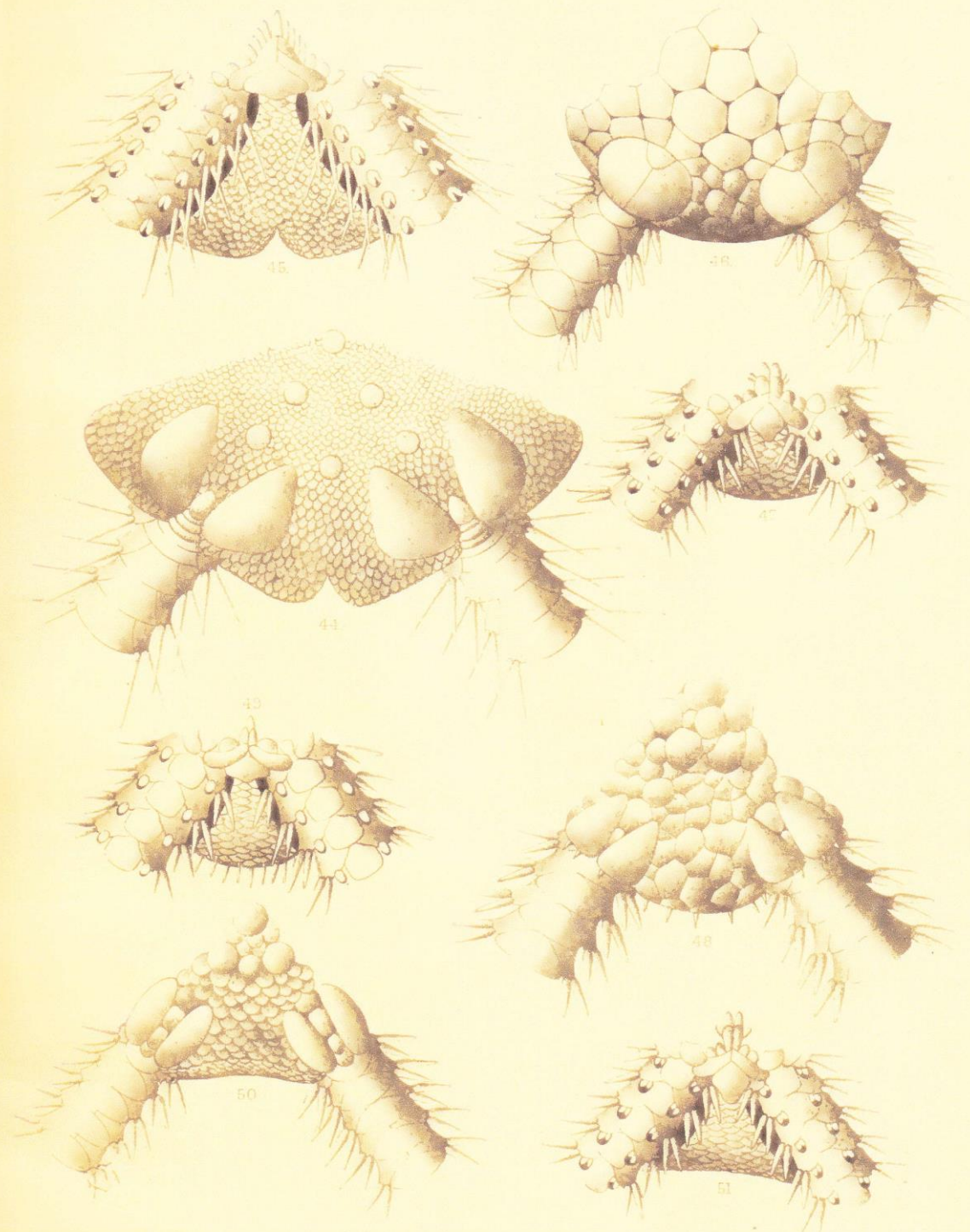
- Fig. 36. — *Ophiomitra integra* Kœhler, dorsal surface. Mag. = 7.
Fig. 37. — *Ophiomitra intrgra*, ventral surface. Mag. = 7.
Fig. 38. — *Ophioglyplia æqualis* Lyman, dorsal surface. Mag. = 9.
Fig. 39. — *Ophioglypha sordida* Kœhler, dorsal surface. Mag. = 10.
Fi». 40. — *Ophiogîtypha sordida*, ventral surface. Mag. = 10.
Fig. 41. — *Ophiogîtypha sordida*, lateral view. Mag. = 14.
Fig. 42. — *Ophioceramis tenera* Kœhler, dorsal surface. Mag. = 12.
Fig. 43. — *Ophioceramis tenera*, ventral surface. Mag. = 12.



36, 37 *Ophiomitra integra* Koehler. 38, *Ophioglypha aequalis* Lyman.
39, 40, 41, *Ophioglypha sordida* Koehler. 42, 43, *Ophioceramis tenera* Koehler.

PLATE VI.

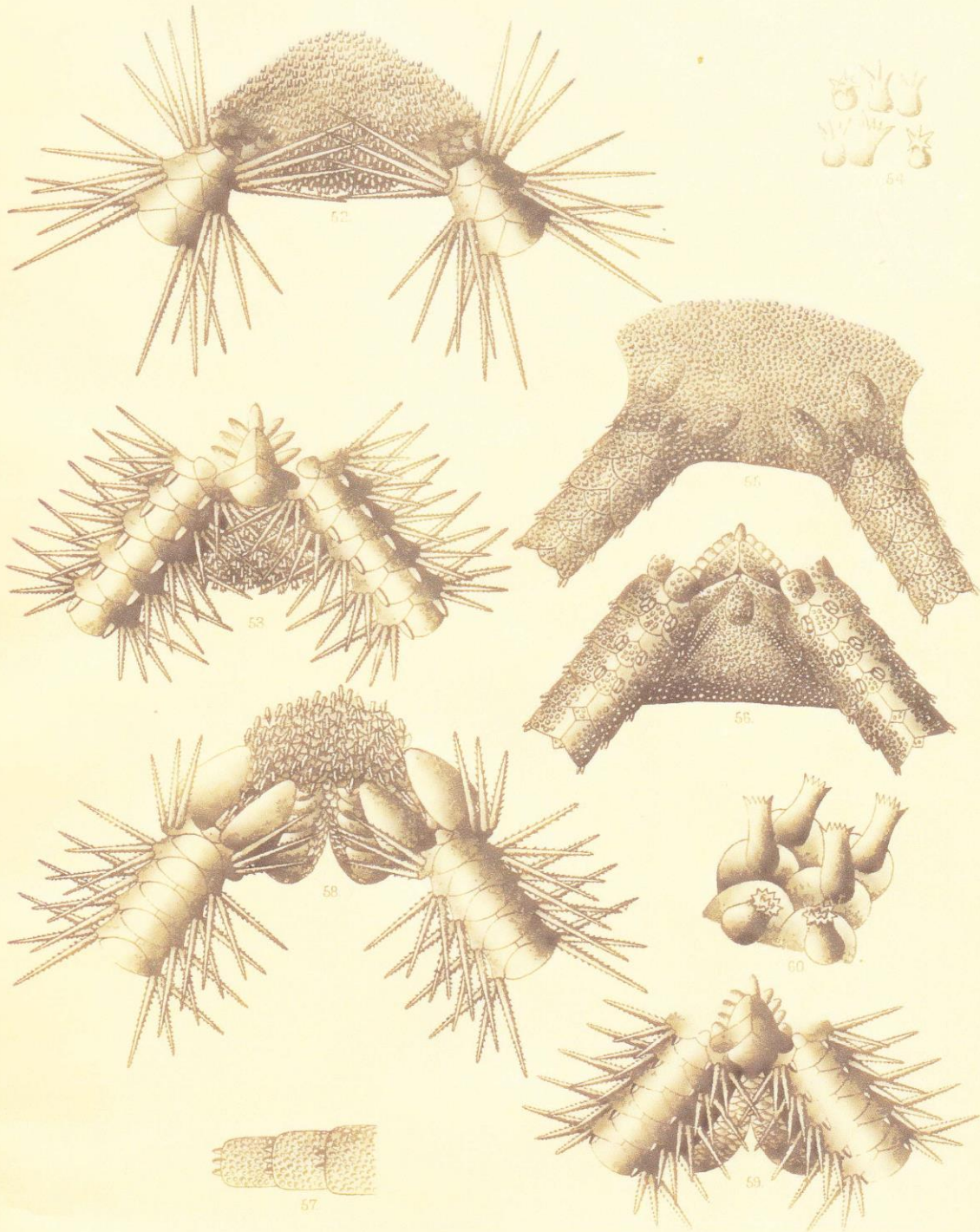
- Fig. 44. — *Ophiochiton ambulator* Kœhler, dorsal surface. Mag. = 4.5.
Fig. 45. — *Ophiochiton ambulator*, ventral surface. Mag. = 4.5.
Fig. 46. — *Ophiactis Lorioli* Kœhler, dorsal surface. Mag. = 13.
Fig. 47. — *Ophiactis Lorioli*, ventral surface. Mag. = 13.
Fig. 48. — *Ophiactis perplexa* Kœhler, dorsal surface. Mag. = 13.
Fig. 49. — *Ophiactis perplexa*, ventral surface. Mag. = 13.
Fig. 50. — *Amphiura Caulleryi* Kœhler, dorsal surface. Mag. = 11.
Fig. 51. — *Amphiura Caulleryi*, ventral surface. Mag. = 11.



44, 45, *Ophiuchites ambulatus* Koehler. 46, 47, *Ophiactis loneli* Koehler.
48, 49, *Ophiactis perplexa* Koehler. 50, 51, *Amphipura Cailleryi* Koehler.

PLATE VII.

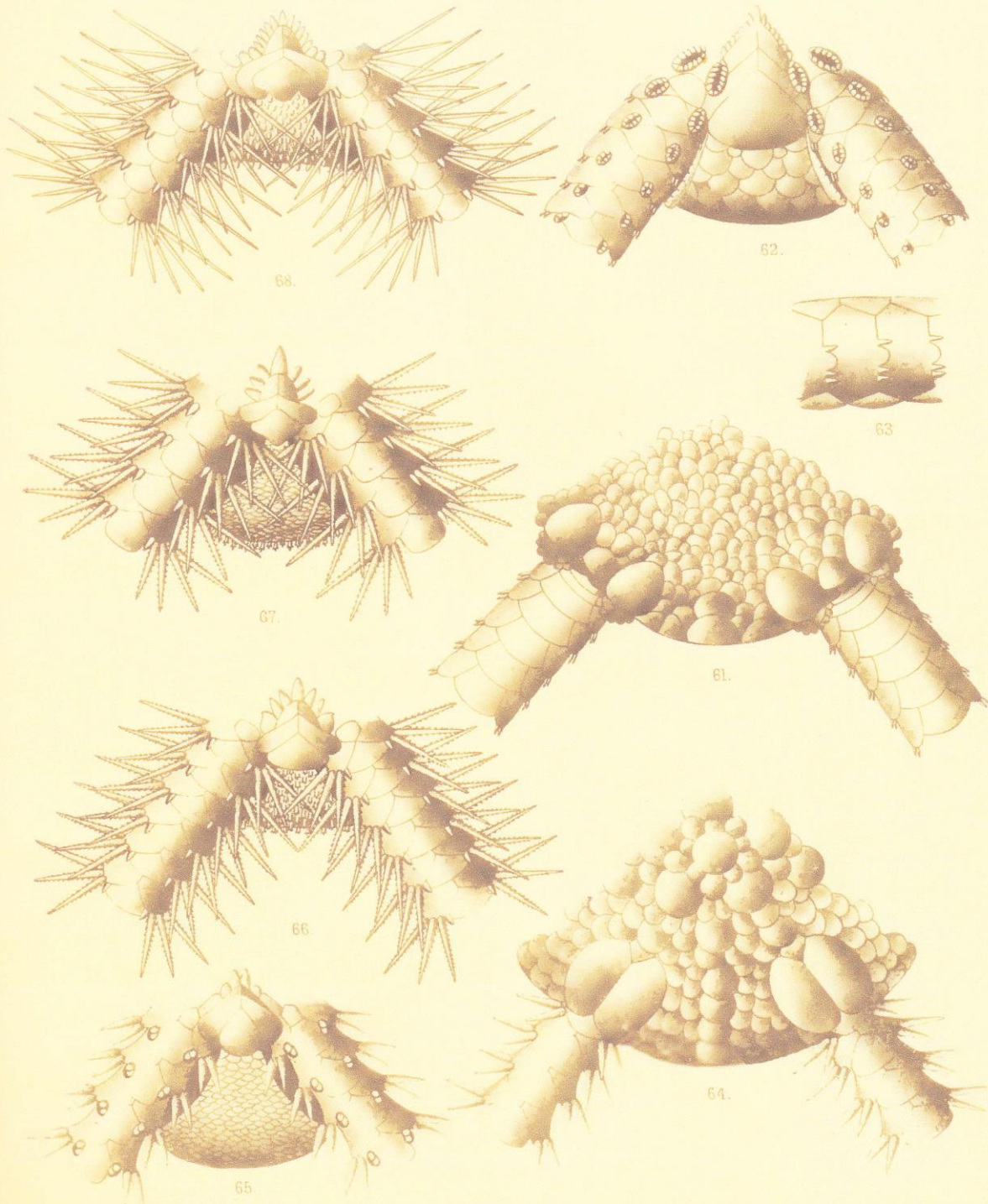
- Fig. 52. — *Ophiacantha vorax* Kœhler, dorsal surface. Mag. = 13.
Fig. 53. — *Ophiacantha vorax*, ventral surface. Mag. = 13.
Fig. 54. — *Ophiacantha vorax*, spines of the disc. Mag. = 30.
Fig. 55. — *Ophiolypus granulatus* Kœhler, dorsal surface. Mag. = 10.
Fig. 56. — *Ophiolypus granulatus*, ventral surface. Mag. = 10.
Fig. 57. — *Ophiolypus granulatus*, lateral surface of an arm. Mag. = 10.
Fig. 58. — *Ophiomitra rudis* Kœhler, dorsal surface. Mag. = 5.
Fig. 59. — *Ophiomitra rudis*, ventral surface. Mag. = 5.
Fig. 60. — *Ophiomitra integra* Kœhler, spines of the disc. Mag. = 20.



52. 53. 54. *Ophiacantha vorax* Koehler 55. 56. 57. *Ophiolypus granulatus* Koehler
58. 59. *Ophiomitra rudis* Koehler 60. *Ophiomitra integra* Koehler

PLATE VIII.

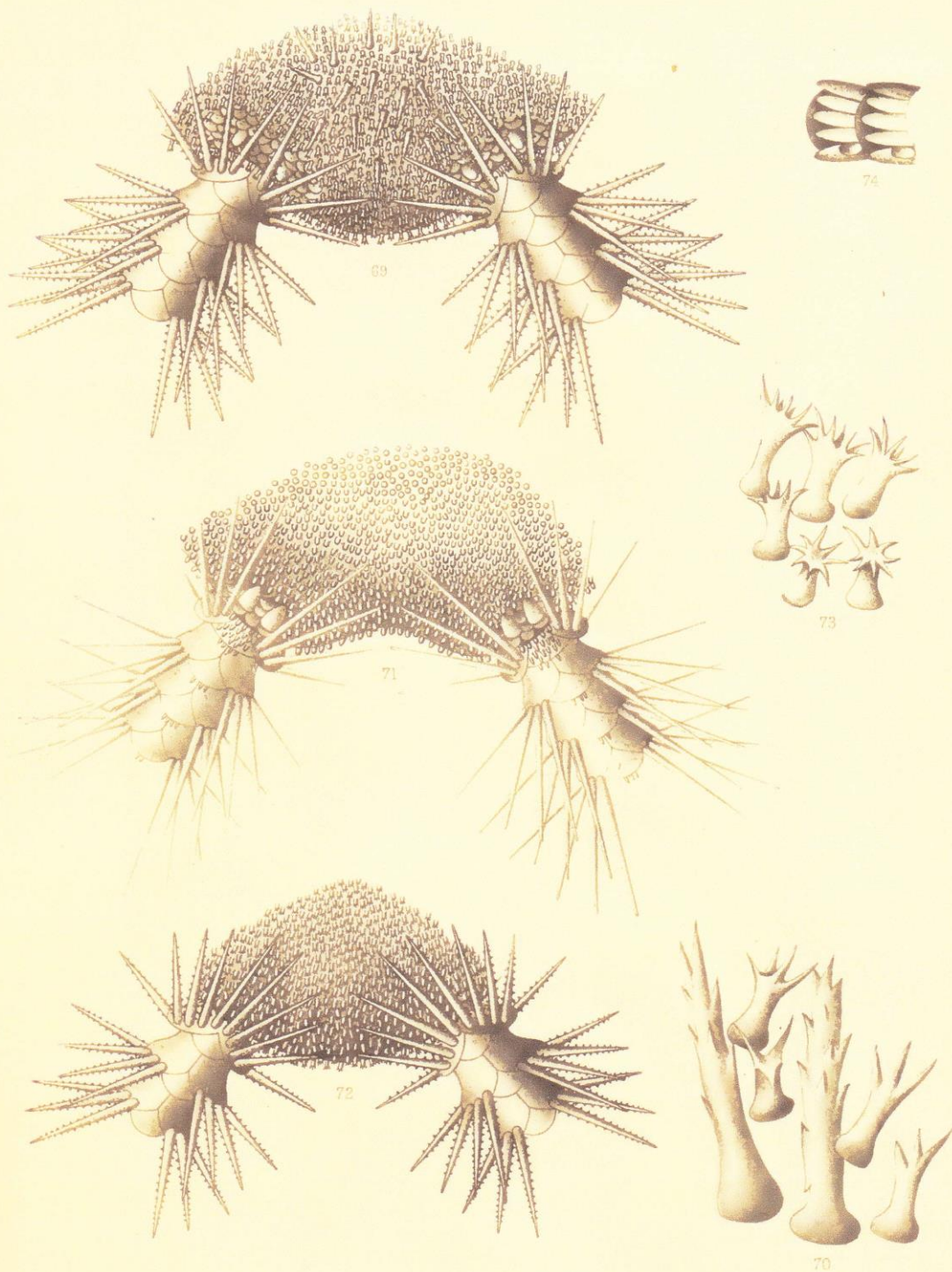
- Fig. 61. — *Ophioglypha involuta* Kœhler, dorsal surface. Mag. = 4.
Fig. 62. — *Ophioglypha involuta*, ventral surface. Mag. = 4.
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Fig. 67. — *Ophiacantha duplex* Kœhler, ventral surface. Mag. = 7.
Fig. 68. — *Ophiacantha gratiosa* Kœhler, ventral surface. Mag. = 5.



61. 62. 63. *Ophioglypha involuta* Koehler. 64. 65. *Amphura misera* Koehler. 66. *Ophiacantha composita* Koehler.
67. *Ophiacantha duplex* Koehler. 68. *Ophiacantha gratiosa* Koehler.

PLATE IX.

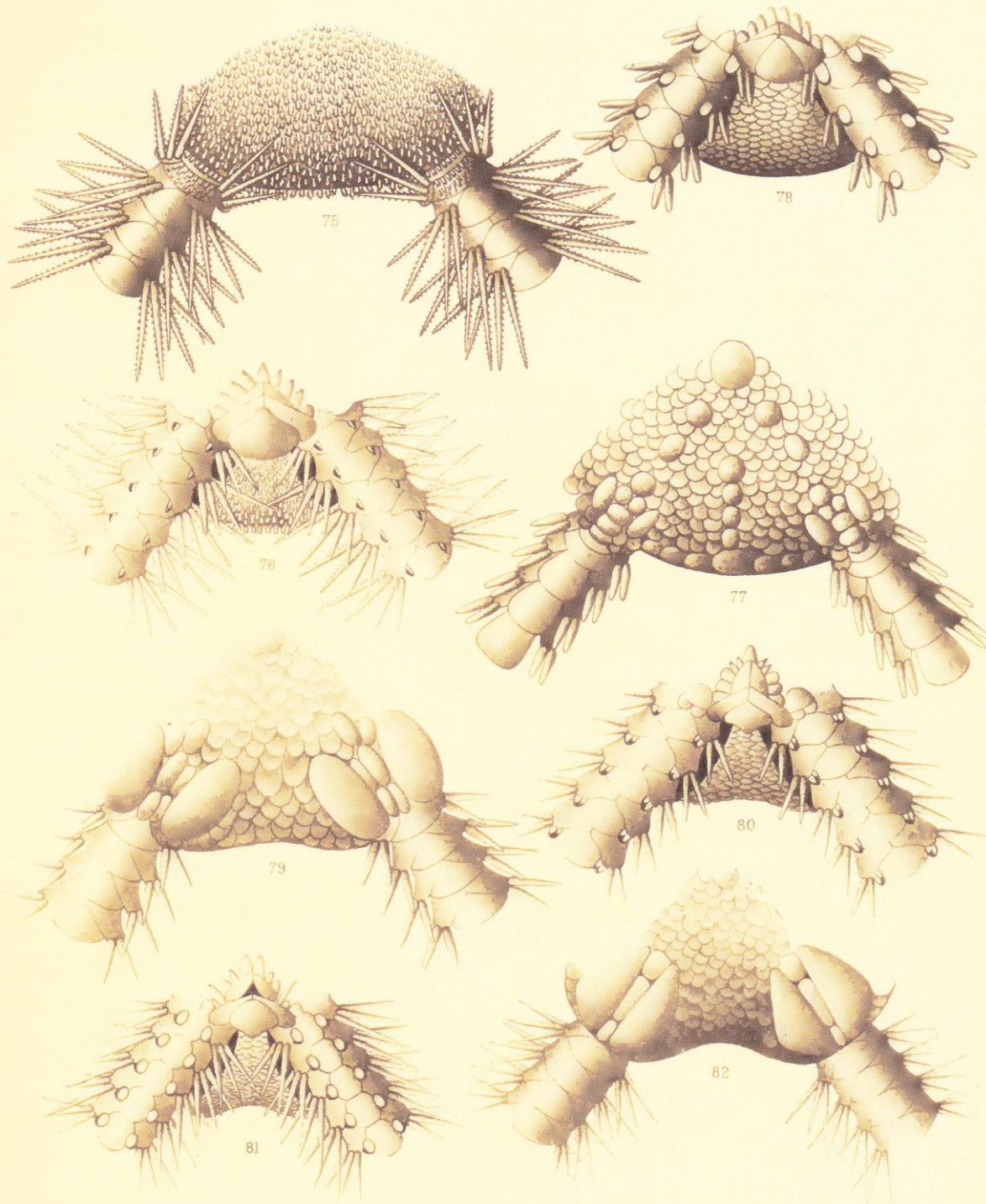
- Fig. 69. — *Ophiacantha duplex*, dorsal surface. Mag. = 7.
Fig. 70. — *Ophiacantha duplex*, spines of the disc. Mag. = 35.
Fig. 71. — *Ophiacantha gratiosa*, dorsal surface. Mag. = 5.
Fig. 72. — *Ophiacantha composita*, dorsal surface. Mag. = 7.
Fig. 73. — *Ophiacantha composita*, spines of the disc. Mag. = 40.
Fig. 74. — *Ophiochiton modestus* Kœhler, lateral view of an arm. Mag. = 35.



69, 70. *Ophiacantha duplex* Koehler. 71. *Ophiacantha gratiosa* Koehler
72, 73. *Ophiacantha composita* Koehler. 74. *Ophiuchiton modestus* Koehler.

PLATE X,

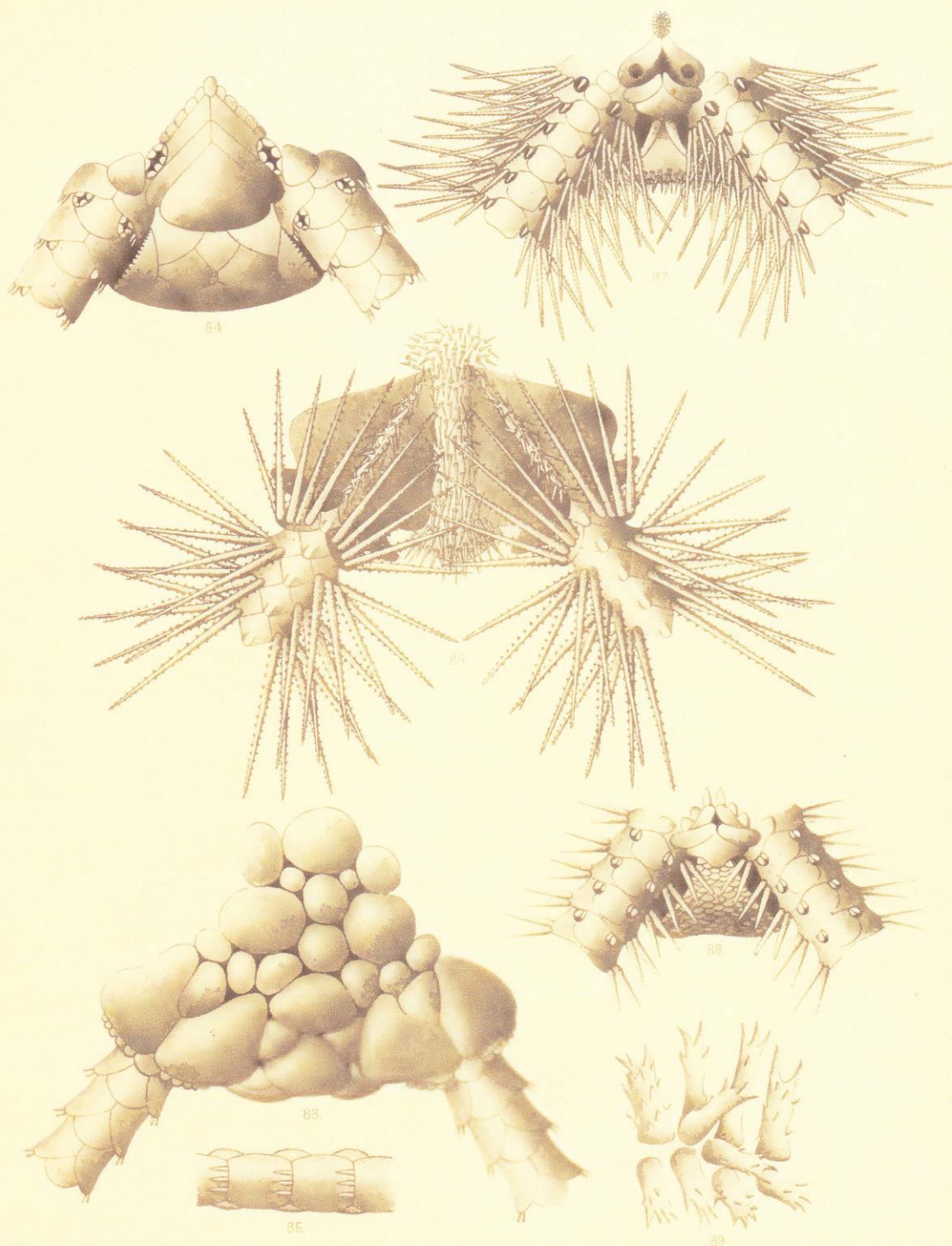
- Fig. 75. — *Ophiacantha sociabilis* Kœhler, dorsal surface. Mag. = 4.
Fig. 76. — *Ophiacantha sociabilis*, ventral surface. Mag. = 4.
Fig. 77. — *Ophiochiton modestus* Kœhler, dorsal surface. Mag. = 26.
Fig. 78. — *Ophiochiton modestus*, ventral surface. Mag. = 26.
Fig. 79. — *Amphiura partita* Kœhler, dorsal surface. Mag. = 11.
Fig. 80. — *Amphiura partita*, ventral surface. Mag. = 11.
Fig. 81. — *Amphiura dispar* Kœhler, dorsal surface. Mag. = 11.
Fig. 82. — *Amphiura dispar*, ventral surface. Mag. = 11.



75. 76. *Ophiacantha sociabilis* Koehler. 77. 78. *Ophiocinton modestus* Koehler.
79. 80. *Amphipura partita* Koehler. 81. 82. *Amphipura dispar* Koehler.

PLATE XI.

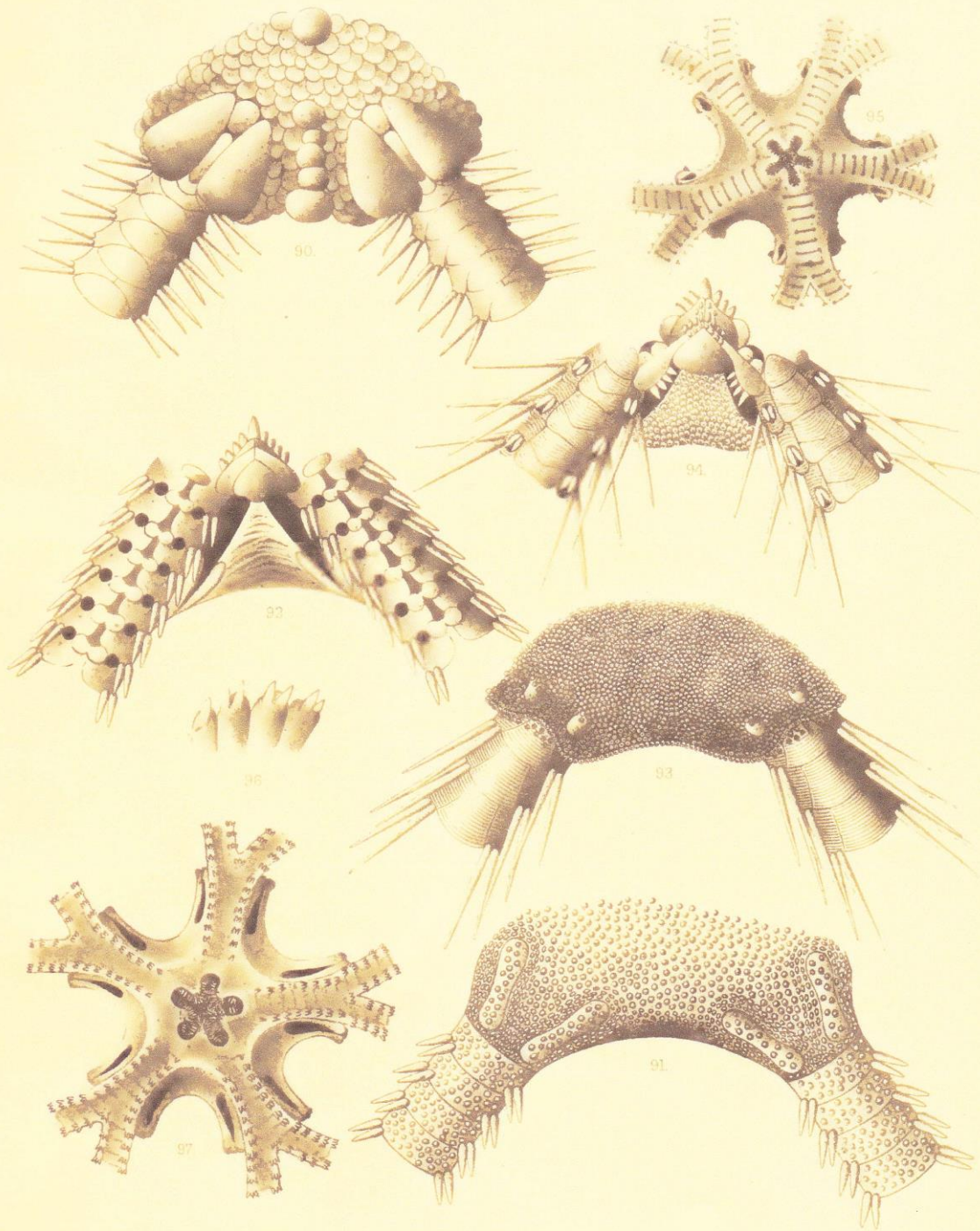
- Fig. 83. — *Ophioglypha inflata* Kœhler, dorsal surface. Mag. = 20.
Fig. 84. — *Ophioglypha inflata*, ventral surface. Mag. = 20.
Fig. 85. — *Ophioglypha inflata*, lateral surface of an arm. Mag. = 20.
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Fig. 87. — *Ophiothrix aristulata*, var. *Investigatoris*, ventral surface. Mag. = 5.
Fig. 88. — *Amphiura frigida* Kœhler, ventral surface. Mag. = 11.
Fig. 89. — *Ophiacantha sociabilis*, spines of the disc. Mag. = 30.



83. 84. 85. *Ophioglypha inflata* Koehler 86. 87. *Ophiostrix vesiculata* var. *investigatoris* Koehler
88. *Amphura trigata* Koehler 89. *Ophiocarpa sociabilis* Koehler

PLATE XII.

- Fig. 90. — *Amphiura frigida*, dorsal surface. Mag.= 11.
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Fig. 92. — *Ophiomyxa bengalensis*, ventral surface. Mag. = 4.
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Fig. 94. — *Ophiopyren bispinosus*, ventral surface. Mag. = 20.
Fig. 95. — *Gorgonocephalus cornutus* Kœhler, ventral surface of the disc.
Fig. 96. — *Gorgonocephalus cornutus*, a group of brachial spines. Mag. = 30.
Fig. 97. — *Gorgonocephalus levigatus*, ventral surface of the disc. Natural size.

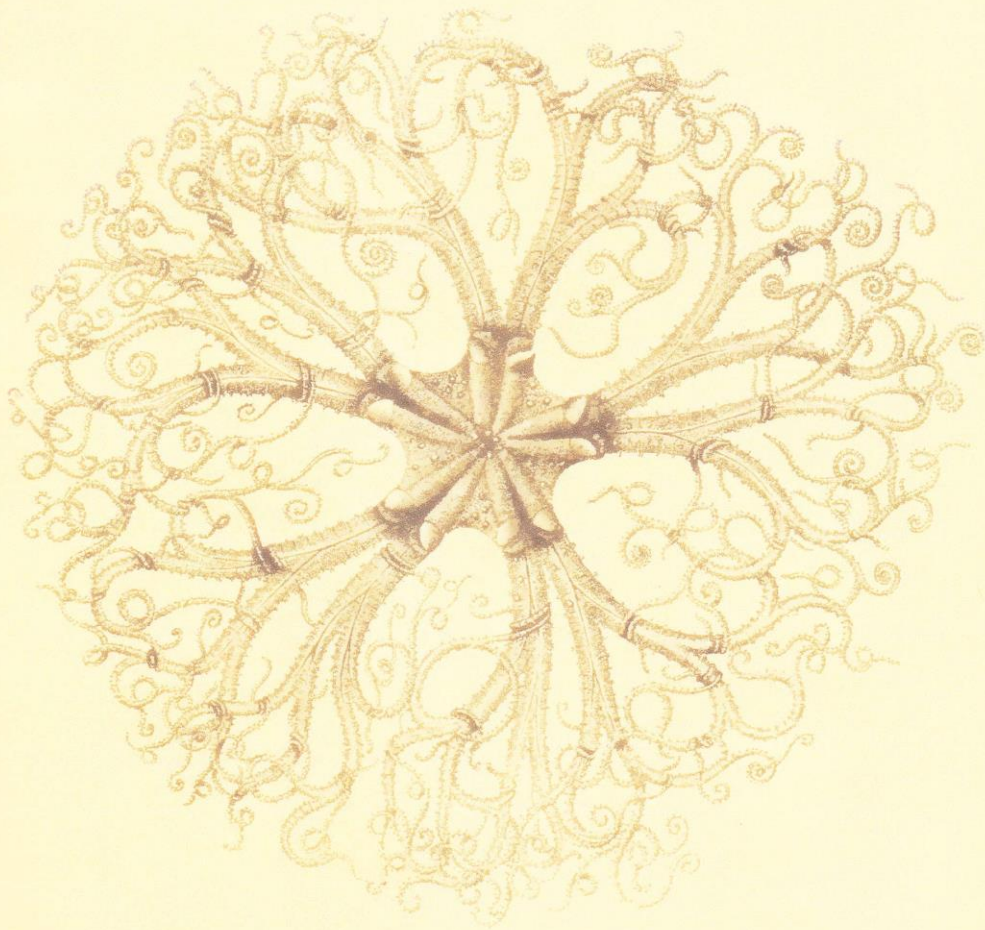


90. *Amphiura frigida* Koehler. 91, 92. *Ophiomyxa bengalensis* Koehler.
 93, 94. *Ophiopyren hispidus* Koehler. 95, 96. *Gorgonocephalus cornutus* Koehler.
 97. *Gorgonocephalus levigatus* Koehler.

PLATE XIII.

Fig. 98. — *Gogonocephalus cornutus* Kœhler, dorsal surface. Mag. = 3.

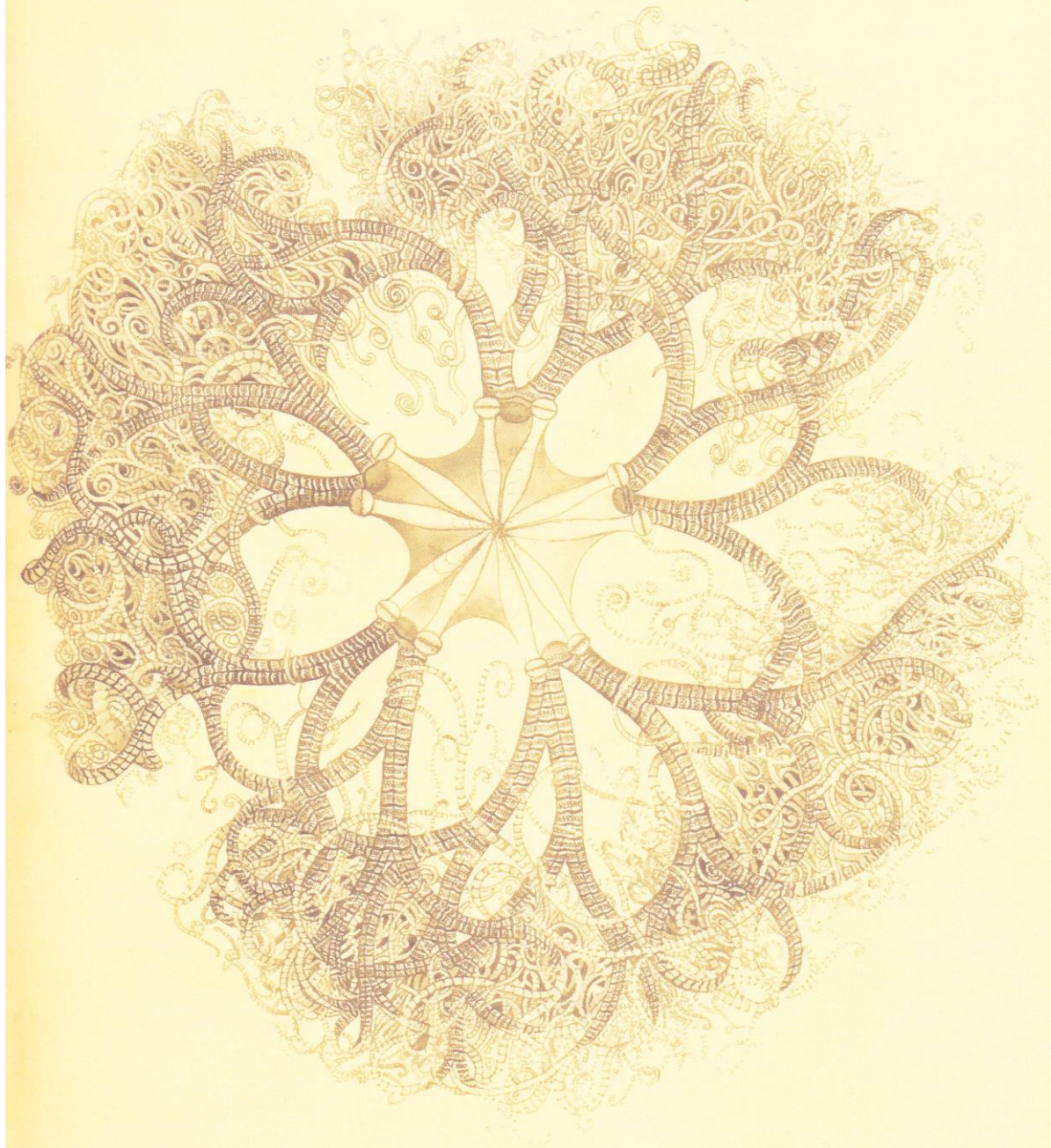
98



98 *Gorgonocephalus cornutus* Koehler

PLATE XIV.

Fig. 99. — *Gorgonocephalus levigatus* Kœhler, dorsal surface. Natural size.



93. *Gorgonocephalus levis* Koehler